











44048/B



19681

Seinell 179  
11/07





AN  
E S S A Y  
ON THE  
T H E O R Y  
OF THE  
PRODUCTION OF ANIMAL HEAT,  
AND ON ITS APPLICATION IN THE TREATMENT OF  
CUTANEOUS ERUPTIONS, INFLAMMATIONS,  
AND  
SOME OTHER DISEASES.

---

By EDWARD RIGBY,  
Member of the Corporation of Surgeons in London.

---

*Minimè in dubium revocari potest theoriam Caloris Animalium  
nobilissimi esse usus in Medicina rectè intelligenda et ritè facienda.*

MARTINE DE ANIMALIUM CALORE.

---

LONDON:  
Printed for JOSEPH JOHNSON, No. 72, St. Paul's Church  
Yard.  
MDCCLXXXV.

1869

ON THE

OF THE

OF THE

PRODUCTION OF ANIMAL HEAT

AND ON ITS APPLICATION IN THE TREATMENT OF

VARIOUS DISEASES AND AFFECTIONS

SOME OF THE



BY THE

MARTIN DE ANIMAEUS CAROLUS

LONDON:

W. & A. G. B. 1869

MDCCCLXIX



---

---

## P R E F A C E.

**T**HE art of healing is, perhaps, of all others, the most calculated to derive improvement from the application of the principles of natural philosophy; as those laws of the animal œconomy which admit an explanation from them must, obviously, be most perfectly understood, and those rules of medical practice which are derived from such a knowledge must, unquestionably, be the best founded.

THE present age has been peculiarly distinguished by its inquiries into the works of nature and by its great attainments in natural philosophy, and the art of medicine, in its several branches, has already

profited by this circumstance: But as this source of improvement has been hitherto much neglected by medical persons, the advantages derived from it are, as yet, but limited, and much, therefore, remains to be done before the practice of physic can acquire that degree of perfection which it is, probably, capable of.

THE nature of the engagements of medical men, and more especially of those who are much employed in their profession, is, however, very unfavourable to pursuits which require many experiments, and necessarily take up much time; and for this reason it, probably, is, that medical men have not been much distinguished by their philosophical writings. On the other hand,



## P R E F A C E.

hand, those who have gone far in philosophical attainments, and have even been distinguished by considerable discoveries in those branches of philosophy which bear a near relation to chemistry and medicine, for want of that variety of facts respecting the œconomy of nature, and those changes in the animal system brought on by diseases, which occur alone to those persons who are immediately engaged in the practice of physic, have been little able to apply them to purposes of real utility. It, therefore, still remains for medical men to make this application; and, though their own philosophical attainments may be very limited, they may, from being possessed of the most genuine facts respecting

specting diseases, perhaps be able to do it with some advantage.

THE first remark, I should hope, will, in some measure, apologize for the imperfection of the philosophical part of the following Essay; as I trust the application I have endeavoured to make of the principles of philosophy in the diseases which are the subjects of the medical part of it, will be some proof of the second.

IN considering some of the obvious facts respecting the existence of heat in the animal body, and its tendency to escape by the surface, it became necessary to premise some theory of its production, and not being satisfied with any of those  
which



which were formerly adopted, or even of those which have been lately suggested, I have given one which appears to me less exceptionable, as being, in my opinion, more conformable to the known laws of nature and philosophy, and from which, many of the facts and phænomena respecting the œconomy of animal life, may, I think, more simply and clearly be explained.

I HAVE not thought it requisite to mention any of the arguments, which, I think, might easily be adduced against the several theories before alluded to, as the mere disproving them would tend but little to confirm the present; and as, should the present be considered as  
a rational

a rational one, it would require no support from such a circumstance.

I AM, however, but little anxious to establish the philosophical part of the following system, if the medical part of it be admitted to be agreeable to truth and just reasoning: Should this be the case, and should it further appear that I have suggested the least improvement in the mode of treating any of the diseases which are the subjects of it, though I may acquire no reputation as a philosopher, I doubt not but it will be allowed that, as a surgeon, I have not been uselessly employed.

NORWICH,  
APRIL 18, 1785.

E. R.



---

# CONTENTS.

## SECTION I.

	Page
<i>Theory of Animal Heat.</i> - -	I

## SECTION II.

<i>General Theory of Cutaneous Eruptions.</i>	74
---	----

## SECTION III.

<i>The Small Pox.</i> - - -	86
-----------------------------	----

## SECTION IV.

<i>The Miliary Eruption.</i> - -	98
----------------------------------	----

## SECTION V.

<i>The Measles.</i> - - -	106
---------------------------	-----

# C O N T E N T S.

## SECTION VI.

	Page
<i>The Scarlatina.</i> - - - -	116

## SECTION VII.

<i>The Erysipelas.</i> - - - -	119
--------------------------------	-----

## SECTION VIII.

<i>Elephantiasis.</i> - - - -	127
-------------------------------	-----

## SECTION IX.

<i>The Tinea Capitis.</i> - - - -	130
-----------------------------------	-----

## SECTION X.

<i>Febrile Rashes.</i> - - - -	142
--------------------------------	-----

## SECTION XI.

<i>The Anthrax.</i> - - - -	149
-----------------------------	-----

## SECTION XII.

<i>The Phlegmon.</i> - - - -	160
------------------------------	-----

*Burns*

# C O N T E N T S.

## SECTION XIII.

	Page
<i>Burns and Scalds.</i> - - -	170

## SECTION XIV.

<i>Spreading Ulcers attended with an extraordinary Sense of Heat.</i> - -	179
---	-----

## SECTION XV.

<i>Hernia Humoralis.</i> - - -	203
--------------------------------	-----

## SECTION XVI.

<i>Hernia Intestinalis.</i> - - -	207
-----------------------------------	-----

## SECTION XVII.

<i>Optthalmia.</i> - - -	211
--------------------------	-----

## SECTION XVIII.

<i>Gout.</i> - - -	224
--------------------	-----

## SECTION XIX.

<i>Local Eruptions and Excoriations.</i> -	236
<i>Morti-</i>	



# C O N T E N T S.

## SECTION XX.

	Page
<i>Mortifications of the Extremities.</i> -	241

## SECTION XXI.

<i>Scurvy.</i> - - - -	253
------------------------	-----

## SECTION XXII.

<i>Obesity.</i> - - - -	293
-------------------------	-----

## SECTION XXIII.

CONCLUSION, - - -	309
-------------------	-----

---

A N  
E S S A Y  
O N T H E  
T H E O R Y O F T H E P R O D U C T I O N O F  
A N I M A L H E A T, &c.

---

S E C T I O N I.

*Theory of Animal Heat.*

A Constant supply of pure atmospheric air is not more necessary for the support of animal life than is a due degree of heat; and, as in the use which all animals make of these two important materials a considerable quantity must necessarily be consumed, it cannot be doubted but the author of nature has provided

B

fresh

fresh and ample sources of both, to answer all the demands of animal life.

IT is well known, that air is received into the lungs of all animals, and it has been one of the great improvements of modern philosophy to investigate the various sources from which air proper for animal respiration is derived; and the experiments of Dr. Priestley and others have shewn, upon how large a scale the operations for this purpose are constantly carrying on in different parts of nature; but how animals acquire heat, and what are the sources from which fresh supplies of this ingredient are obtained, has not yet been so satisfactorily explained by philosophers.

IT is very evident that the common, sensible, and external sources of heat are very inadequate to this purpose; and as it must therefore be produced independent of any communication from without, the  
immediate



Immediate source must be a latent and an internal one.

As the heat of all living animal bodies considerably exceeds that of the usually surrounding atmosphere; it is obvious, so far from any heat being derived from it, (as that which contains the smaller quantity cannot, according to the great law of heat, communicate to that which has the larger quantity,) that, on the contrary, the body must communicate heat to the external air; and if we consider the great difference subsisting between the temperature of the human body, and that of the atmosphere even in our climate, it is clear that a very large portion of heat must be always escaping from the body, and of course, such a quantity must be lost as to require the constant reproduction of a considerable quantity in the body, to maintain the due proportion between them.

THERE are but two ways in which animals receive into their bodies what is necessary for their vital support; the one is by the lungs, and, as before observed, is the common atmospheric air; and the other is by the stomach, and is food of various kinds.

THE modern philosophical doctrine of latent heat has shewn, that, over and above the sensible heat found in all bodies, they contain much of the matter of heat in a concealed and fixed state, and which is not separated from them but by their decomposition, or the disunion of their component parts: and there can be no doubt, therefore, but the different articles of food, which may be all comprehended under vegetable and animal substances, contain a considerable quantity of the matter of heat in this combined state, and that they give it out when undergoing decomposition; and if we advert  
to

to what passes in the stomach, and recollect that the great office of that organ is to digest, or, in other words, to decompose the food, we may easily suppose that this operation is attended with the production of heat.

THE experiments of Sir John Pringle and Dr. Macbride, upon the dissolution of different articles of food, and which were made expressly with a design of imitating the process of digestion in the animal stomach, all prove, that this operation is attended with the peculiar *intestine motion* characteristic of fermentation, and confirm the propriety of the modern chemical definition of that process, namely, that it is  
 “ *an intestine motion arising spontaneously*  
 “ *among the insensible parts of a body, pro-*  
 “ *ducing a new disposition, and a different*  
 “ *combination of those parts \*.*”

THERE

\* There is, obviously, an awkwardness, not to say absurdity, in the terms of this definition of fermentation.



THERE can be no need of new facts to prove the existence of heat in a combined state in the substances at present under consideration, or the sensible production of it when they undergo a decomposition, or a new arrangement of their component parts.—Fermentation and putrefaction are the means by which this change is produced, and every one who has at all attended to these processes, cannot be ignorant how great a quantity of heat is produced by them.—The vegetation of seeds, which is likewise a decomposition, by which a new arrangement is produced, the body in this instance assuming a new form that is obvious to our senses, is attended with the same production of heat:

tion, particularly in the use of the words *spontaneously* and *insensible*: but as it is the definition of so celebrated a chemist as Macquer, and has been adopted by Dr. Macbride and others, and more especially as it is sufficiently clear respecting the fact I allude to, as brought about by that process, namely, *the production of a new disposition, and a different combination of the parts of a body*, I have not judged it necessary to reject it.

What

## ANIMAL HEAT.

What is the common operation of malting barley, but the exciting a quick vegetation of the grain? and is not the heat produced by this process so great as to require the skill of the workman to keep it within proper limits?

THE decomposition of bodies does not, however, take place but under some peculiar circumstances.—The perfect and fixed state of a body depends upon the exact and proportionate combination of its several ingredients, and their separation cannot take place without the balance between the several parts being destroyed: thus, supposing water and the matter of heat to be two of the principal ingredients which enter into the composition of a grain of barley, if a superabundance of these be given it, the exact proportion between them and the other materials forming the body, will be taken away, the perfect cohesion of the several parts which depended upon that proportion will cease,  
and

and each individual part be rendered liable to be acted upon by the surrounding medium, to which it was before insensible, Thus we may see, why wetting the barley and exposing the grain to a warmer air produces the operation of malting; why the gardener, in preparing his hot beds, throws the dung into heaps, and waters it to promote a quick putrefaction and the consequent generation of heat; why vernal suns and vernal showers call into life the vegetable world, and why the various kinds of food, when admitted into the stomach should, when assisted by heat and moisture, and the peculiar action of that organ, undergo the most perfect decomposition; and why the matter of heat which probably forms a very considerable part of them, should be there separated, and rendered capable of diffusing itself through every part of the body for the support of life. The addition of moisture alone without heat, will, also, in like manner, produce the decomposition of the grain;  
but



but it will not, in this case, be by the vegetative, but by the putrefactive process, as every farmer knows, that grain of all sorts in very wet weather, if cold at the same time, will not grow but rot in the ground,

THE sense of superior heat which is, obviously, felt in the region of the stomach, is a proof that if that be not the seat of the immediate source of all animal heat, at least that a considerable quantity originates there, and strongly confirms the before-going remark, that heat is excited during the decomposition of our food. And if we trace the food through all its changes, and consider that it undergoes several new arrangements in its progress through the different parts of the body, we may possibly be led to suppose, that the heat produced by the first decomposition of the food in the stomach is not all which it brings with it into the animal; for, as all bodies which assume a

new arrangement of their component parts are rendered capable of retaining more or less heat in a concealed state, and as consequently every such change must be productive of sensible heat or cold, by the new body absorbing or letting out the matter of heat, as in the familiar instances of the conversion of vapour into water, water into ice, and vice versa, and as the production of heat must answer a vital purpose more than that of cold would do, it is no improbable conjecture to imagine, that every such change occasions heat.

AN idea which very much agrees with this theory of the production of animal heat in the stomach, and of the escape of it when the different kinds of food undergo decomposition, was entertained by Dr. Franklin many years ago, and probably long before the present doctrine of latent heat engaged the attention of chemists; for he says, “ I have been inclined to think  
“ that

“ that the fluid *fire*, as well as the fluid  
 “ *air*, is attracted by plants in their  
 “ growth, and becomes consolidated with  
 “ the other materials of which they are  
 “ formed, and makes a part of their sub-  
 “ stance: that when they come to be di-  
 “ gested, and to suffer in the vessels a kind  
 “ of fermentation, part of the *fire*, as well  
 “ as part of the air recovers its fluid, ac-  
 “ tive state again, and diffuses itself in  
 “ the body, digesting and separating it:  
 “ that the *fire* so re-produced by diges-  
 “ tion and separation continually leaving  
 “ the body, its place is supplied by fresh  
 “ quantities arising from the continual  
 “ separation; that whatever quickens the  
 “ motion of the fluids in an animal,  
 “ quickens the separation and reproduces  
 “ more of the *fire*, as exercise; that all  
 “ the fire emitted by wood and other  
 “ combustibles, when burning, existed in  
 “ them before in a solid state, being only  
 “ discovered when separating; that some  
 “ fossils, as sulphur, sea coal, &c. con-



“tain a great deal of solid *fire*; and that,  
 “in short, what escapes, and is dissipated  
 “in the burning of bodies, besides water  
 “and earth, is generally the *air* and *fire*  
 “that before made parts of the solid \*.”

It may, indeed, be objected to the above doctrine, that one kind of food, and which in cold climates forms the greatest part of human food, and on which some animals live wholly, does not, under the common circumstances of decomposition, emit any heat; it being the opinion of many chemists, that when the putrefaction of animal substance takes place, even with the greatest rapidity, and the largest possible quantity of phlogiston is set at liberty, that not the least degree of sensible heat accompanies its escape: it must, I believe, be admitted, that under the ordinary circumstances in which this process is carried on, that no heat is sensibly excited; but as there can

\* Last edition of his Letters, page 346.

be no doubt but the matter of heat exists in all animal as well as vegetable substances, as the one is not less inflammable than the other, it must be equally certain that this matter is set at liberty when they undergo a perfect decomposition; but, probably, in the moment of its escape from animal substances it immediately enters into some new combination, by which it is again concealed from our senses; and it appears to me very probable, that the peculiar, and perhaps more perfect method in which the decomposition of food is carried on in the stomach, and the particular circumstances under which the escape of heat from it is there effected, prevents such a combination taking place, as in the common circumstances of putrefaction renders it insensible.

I BELIEVE it is pretty generally supposed, that inflammable air is a combination of phlogiston and the matter of heat; and admitting this to be true, there can be no doubt of the existence of heat in animal substance, as it appears from some late experiments

## THEORY OF

experiments of Dr. Priestley (one of which I will subjoin) that this air may be obtained from such substances: “ On the  
“ 17th of August I exposed in the sun,  
“ in a large retort of rain water, 3 dwts.  
“ 6 grains of roasted beef, the neck of the  
“ retort being plunged in water nine  
“ inches deep, in a jar that nearly fitted  
“ it; and moreover closed it with a cork,  
“ in which was a very small perforation,  
“ so as to give it as little communication  
“ with the external air as possible. On  
“ the 9th of September I took from it  
“ two-thirds of an ounce measure of air,  
“ all inflammable \*.”

AND, as a farther objection, it may, perhaps, be observed, that the natural food of infants, in whose bodies a greater degree of animal heat is known to be produced than in adults, does not appear to undergo that decomposition and those changes which have before been considered

\* Experiments and observations relating to natural philosophy, &c. vol. v. page 56.

as necessary to the production of heat. This will, however, I am persuaded, be found, upon enquiry, not to be true; as milk is certainly capable of the fermentatory process; every one knows how soon, when exposed to the common temperature of the atmosphere, it will become sour, to do which, it is plain it must go through the preceding stages of fermentation; and as we are told from very good authority\*, that some northern nations have a method of obtaining a vinous and inebriating liquor from milk, the fermentatory process which produces this, must very much resemble that of the vegetable and farinaceous substances, the decomposition of which is, as before observed, well known to be attended with the production of much heat.

If it be true, then, that the generation of heat for the use of the animal is carried on in the stomach and alimentary canal, and that the immediate source of it is the food, there can be no doubt but many of

\* Macbride.



the common facts in the animal œconomy will be accounted for by this theory: and in the first place we should expect to find a consent between the organ in which the heat is first set at liberty, and the surface of the skin where it passes off from the body; and as the reproduction of it should bear a proportion to the waste of it, that the sense of hunger, which is the feeling by which all animals are prompted to supply the stomach with new materials for its production, should be more or less urgent, as a smaller or greater quantity of heat escapes by the surface; and that, therefore, under those circumstances, in which the difference between the heat of the human body and the surrounding atmosphere is so small that the heat passes off most slowly, and there is consequently the least occasion for a quick supply of it, that the sense of hunger should be most feeble, and the quantity of food taken be smallest; and that under circumstances the reverse of these, the sense of hunger should be strongest, and the quantity of food should be greatest: it is natural to suppose, that

that where the atmosphere is hottest, the former should take place, and where the air is coldest, that the latter should happen. Accordingly, it is well known, that the inhabitants of cold climates eat a larger quantity, and of a more substantial food, than the inhabitants of warmer climates; that the appetite in most people is keener in winter than in summer, and in those persons whose employments expose them constantly to the open air and exercise, than in those who are sedentary and live chiefly in warm rooms; and from the same cause we may easily understand, what is likewise a well known fact, that the evil of unsatisfied hunger is dreadfully aggravated by exposure to cold. “Dum novo  
“reficimur & turgemus alimento, blando  
“perfundimur calore; aerisque frigidi injurias facilius longè saturi toleramus,  
“quam esurientes & inaniti \*.”

As in the production of all other animal matters, a due proportion is, in a

\* Martine de animalium Calore, pag. 225.

state of soundness, always observed between the secretion and the excretion, there can be no doubt but a perfect state of health requires that an equal balance should subsist between the waste and supply of animal heat ; and that if either the surface be unable to carry off what has been generated within, or if more be carried off than the internal organ can supply, a state of disease must, in either case, be induced ; and, agreeable to these premises, it is notorious, that if the quantity of food received into the stomach be too small, or if the powers of the stomach be unable to digest it, that paleness, feebleness, and coldness come on, and the body shrinks ; and it is equally obvious, that when the situation of persons prevents the due escape of heat from the surface, and yet from indulging the appetite, a larger quantity of food is taken than is necessary, that a superabundance of heat must be produced, which occasions in such persons a disposition to grow fat, and renders them particularly liable to diseases of the  
inflammatory

inflammatory kind, the truth of which every one's observation must confirm.

THE circumstance of the increase of bulk of persons in the situation just described being owing solely to an accumulation of the fat, or cellular substance, is, perhaps, more worthy of notice, and more immediately connected with the foregoing theory than may, at first, be imagined. Little as the nature of the matter of heat and of the principle called phlogiston can be known, from the impossibility of investigating them, being both substances of which our senses can take but little cognizance, except in observing the difference which is produced in various bodies by their presence or their absence; yet, there can be no doubt that if not nearly allied, that they are, for the most part, found united in the same body, and that their escape is at the same time, as is evident from the different operations of combustion and putrefaction,



the matter of heat excited, being usually attendant on, and probably, in proportion to the quantity of phlogiston set at liberty ; and, as the substances termed inflammable are known to contain the largest quantity of phlogiston, and the most inflammable of these are oily, fat, and unctuous bodies, may we not suppose, that such contain the greatest quantity of the matter of heat ; and, therefore, may we not fairly presume, that the remarkable increase of the fat and unctuous parts of the body, which takes place in persons who are constantly receiving into their bodies more of the matter of heat than can effect an escape by the surface, is principally owing to a deposition of the matter of heat in those substances. And from the foregoing consideration, perhaps, it may appear to be not unlikely, that when the matter of heat is extricated from the food in the stomach, and is at liberty to diffuse itself through the animal, that it is disposed of in two different ways ; probably, part of  
it

it enters immediately into the composition of the animal body in a combined state, forming an organic part of the animal compound, and contributing, in the young subject, to the increase of its growth, and in the adult, to the preservation and constant renovation of that bulk of matter which it has attained by maturity, and the remainder, being the superabundance, passes through the animal body in a sensible state, and is carried off from the surface by the surrounding atmosphere.

THOSE who are conversant with anatomy well know how much the cellular substance contributes to the bulk of animals, even in those which cannot be called fat, and in those parts of the body which are called muscular; the dissection and maceration of muscles having proved that they consist of an infinite number of fibres united by this cellular substance, and that each fibre, as far as can be traced by the eye, even assisted by glasses,

glasses, consists of still smaller fibres united by the same connecting substance.

It may, however, appear extraordinary, that a matter which is so subtile, and seems to occupy so small a space as to elude our senses, should contribute so much to the production and increase of so bulky a material as animal fat; but this will not appear surprising, if we recollect what form the principal ingredients in the most dense and compact kinds of matter; chemical experiments, which have lately been much assisted by the application of the burning lens, having proved, that the most solid piece of oak consists of nothing but air, water, the matter of heat, and phlogiston.

As the principle of inflammability is certainly contained in all animal and vegetable substances as well as the matter of heat, and as they both make their escape when these substances are undergoing decomposition, there can be no doubt but this principle

principle is also admitted into the animal system, for some vital purpose; constituting, perhaps, in conjunction with the matter of heat, the whole of our nutriment, and as there must be a constant production of this, as well as of the matter of heat, in the stomachs of animals, from the food received into them, there must, obviously, be some outlet by which the superabundant quantity may pass off.

THE nature of the air thrown out of the lungs, evidently proves, that the principal part of that which has passed the circulation finds an exit thence; for however, one might expect, that the principle of inflammability would accompany the matter of heat in its escape from the surface of the body, it has been proved by some experiments of Dr. Priestley, that what passes from the skin in a state of health, and in the ordinary temperature of the body, does not render the air foul, and consequently does not impart to it  
any



any phlogiston. It is, at the same time, well known, that inflammable air is contained in the lower intestines, and frequently passes from them per flatum. This is, probably, immediately produced from the fœces in the intestines, and as it has been before observed, that the production of heat usually accompanies the escape of phlogiston, it serves to prove, that in the very last stage of decomposition which the food undergoes, in its passage through the body, that one of the purposes intended by its introduction, namely the generation of heat, is still continued.

I FIND in Dr. Priestley's last volume of Observations on different Kinds of Air, &c. that he is led, by some experiments made on alimentary substances, to suppose that phlogiston alone is the principle of nutrition. He says, page 64, " The experiments recited in this and the following section were entered upon chiefly to discover the *principle of nutrition* " in

“ in vegetable and animal substances, and  
“ they seem to lead us to suppose, that  
“ this principle is phlogiston, or the prin-  
“ ciple of inflammability, in such a state  
“ as to be capable of becoming, by putre-  
“ faction, a true inflammable air.

“ IN the putrefactive process the phlo-  
“ giston is merely evolved, and not again  
“ combined with any thing except what  
“ may be necessary to its assuming the  
“ form of inflammable air; but in nutri-  
“ tion it is immediately held in solution  
“ by the gastric juice and in the chyle  
“ formed by it.”

IF it be true, then, as before observed,  
that phlogiston becomes inflammable air  
by the combination of the matter of heat,  
we may easily account for the absorption  
of that heat which is separated in the com-  
mon putrefactive process of animal sub-  
stance, and in consequence of which, it is  
concealed from our senses. And, if it be

also true, as Dr. Priestley imagines, that when the dissolution of the same substance takes place in the stomach under the process of digestion, that the phlogiston is not combined with heat, but is immediately taken up by the gastric juice, we may further understand, why the matter of heat is generated under these circumstances in a sensible state, and is, therefore, at liberty to be diffused through the body, as before intimated.

BUT, as phlogiston and the matter of heat are certainly both equally extricable from vegetable, as well as animal substances, when they undergo putrefaction, it may seem strange, that the matter of heat should not, in this instance, as well as in that of animal substance, unite with the phlogiston, and be concealed in the new compound of inflammable air.

THE only conjecture I can give for such a difference in operations, which, in all other

other respects, are, apparently, so similar, is, that, probably, these two materials do not, in the instance of vegetable putrefaction, separate at the same time; the matter of heat being, possibly, so loosely combined with the vegetable substance, that it is set at liberty, and totally dissipated before the phlogiston is disengaged.

AND, that the matter of heat is but loosely retained in vegetables, is evident from its being easily separated from them in the lowest temperatures, by the sole addition of moisture; it is well known, that stable dung, if not dry, will heat and rot in the most severe frosts, and that what the gardeners call long muck, will, if thrown in a heap and watered, undergo the necessary process for the hot bed in the coldest seasons; whereas animal substance, if kept ever so wet, will resist putrefaction for a long while, even when the atmosphere is in temperature some degrees above the freezing point.



It may be remarked, too, that putrefaction in vegetables is a slow process, and is not completed until a long while after the escape of the heat from them, while in animal substance, though the concurrence of considerable heat as well as moisture is required to induce putrefaction, yet, when once the process is began, it goes on very rapidly; all the materials of which it is composed, being, probably, set at liberty at the same time, and, therefore, more quickly dissipated.

WERE the decomposition of vegetable matter to take place equally rapidly, probably, the same union of the matter of heat and phlogiston would be produced; and this, indeed, seems to be the case in combustion, though under the circumstances in which this operation is commonly carried on, it is obvious, that the inflammable air, which is produced by this union, cannot be preserved: This appears, however, to have been completely effected in Dr. Priestley's

Priestley's late extraordinary experiment on charcoal, with the burning lens, the decomposition of the vegetable matter being, in this instance, so quickly obtained, that the component parts of the body were set at liberty at the same time, and were, moreover, under circumstances in which the new compound of inflammable air, resulting from it, was rendered obvious and preserved.

ADMITTING, then, these premises, the difference, as respecting the sensible production of heat, observable between the process of putrefaction in animal and in vegetable substance, will be easily understood, and the objection to the present theory, which arises from the generally received opinion of there being no heat generated in the decomposition of animal substance, and which has been before taken notice of, will be fully obviated.

IT is well known, that nothing more immediately tends to lessen the heat of the animal system than evacuation by the bowels, and on this principle, is doubtlessly founded the universal practice of purging in inflammatory complaints.

IF these means were found useful only in inflammations of the bowels themselves, this cooling effect might be supposed to be derived from the mere removal of what excited heat in them, by its bulk, in preternaturally distending the part, or by its acrimony, in irritating it. But experience has sufficiently proved, that unloading the bowels removes the general heat of the whole habit, and that inflammations of parts very remote from the intestines are relieved by the general diminution of heat, brought on by such means.

THERE can be, therefore, no doubt, from this circumstance, that the generation of heat is most moderate when the stomach and bowels are the least filled;  
and

## ANIMAL HEAT. 31

and if so, it surely furnishes another argument of the probability of the original source of it being in the aliment received into the stomach.

THAT much of the heat which is generated in the living animal body is constantly endeavouring to escape by the surface, is evident from a variety of facts.

THE universal custom of the inhabitants of all countries in which the temperature of the atmosphere is in the smallest degree lower than human heat, making use of apparel, and this being thicker or thinner in proportion to the respective differences of seasons and climates, is certainly a proof of this, as being evidently intended to prevent such an escape of heat from the body as would be unpleasant and injurious. The same thing may be observed of the natural cloathing of different animals; in warm climates their coats are short, smooth, and lie close to the skin, but in the northern regions their covering consists of a rarer substance, as wool, fur,



fur, &c. and in birds this circumstance is peculiarly striking; as they pass freely through the air, and are constantly exposed, in the higher regions, to currents of cold air, their natural heat would pass off much too quickly if they were not covered with a substance which conducts heat very slowly, which feathers are well known to do; and in those birds which live in the water, which conducts heat much quicker than air, their covering is still more rare than common feathers; the down upon the breast and under the bellies of those birds, which in cold climates live principally in the water, being, perhaps, the slowest conductors of heat in nature; modern luxury, having, on this principle, set so great a value on the down of the Eider Duck, and its use in retaining heat in the part to which it is applied, being well known in fits of the gout, to which cases, on account of its extraordinary lightness, it is particularly well adapted, as the parts affected are usually so exquisitely tender, as to suffer pain from the contact of whatever has weight, or occasions pressure.

THE

THE slow conducting power of this down, being evidently owing to its very rare texture, it is obvious, that to retain this quality it should remain perfectly dry, as the finest plumage will, when wet, very soon collapse together, and form a body capable of carrying off heat, perhaps, very quickly. To guard against this circumstance, nature has furnished water fowls with a peculiar kind of oil, and has given them the power of occasionally opening the receptacle where it is deposited, and of spreading a sufficient quantity of it over their outermost feathers, by which they are effectually protected from the contact of the water, and their texture is preserved uninjured\*.

IT

\* “LEST the feathers should spoil by their violent  
 “attrition against the air, or imbibe the moisture of  
 “the atmosphere, the animal is furnished with a gland  
 “behind, containing a proper quantity of oil, which  
 “can be pressed out by the bird’s bill, and laid smoothly  
 “over every feather that wants to be dressed for the  
 F “occasion.

It may be likewise observed, that even in the same animals, a difference, respecting the heat-conducting power of their covering, takes place under different exposures; that in summer it is less calculated to retain their heat than in winter, and when protected by the external cold,

“ occasion. This gland is situated on the rump, and  
 “ furnished with an opening, or excretory duct; about  
 “ which grows a small tuft of feathers, somewhat like  
 “ a painter’s pencil. When, therefore, the feathers  
 “ are shattered or ruffled, the bird turning its head  
 “ backwards, with the bill catches hold of the gland,  
 “ and pressing it, forces out the oily substance, with  
 “ which it anoints the disjointed parts of the feathers,  
 “ and drawing them out with great assiduity, recom-  
 “ poses them, and places them in due order; by which  
 “ they unite more closely together. Such poultry,  
 “ however, as live for the most part under cover, are  
 “ not furnished with so large a stock of this fluid, as  
 “ those birds that reside in the open air. The feathers  
 “ of an hen, for instance, are pervious to every shower;  
 “ on the contrary, swans, geese, ducks, and all such  
 “ as nature has directed to live upon the water, have  
 “ their feathers dressed with oil from the very first day  
 “ of their leaving the shell.”—Goldsmith’s History of  
 the Earth and Animated Nature, vol. v. page 4.

by

by living within doors, than when exposed to it when living in the open air. The horse may be considered as a very familiar instance of the truth of this remark, for every one knows how long and rough the coats of those are which winter abroad, and how short and smooth are the coats of those which are kept in warm stables; and that it is a common practice with those who have the care of horses, to cover them with woollen cloths, to make their skins fine; and that, consequently, in the former situation, it being of so loose and rare a texture, it must carry off heat very slowly; and in the latter, for the contrary reason, that it must carry it off much faster.

It may be remarked, that all animals, when the heat is passing off from them in an inconvenient degree, endeavour to check it by lessening the surface of their bodies, which is exposed to the surrounding medium; thus we see, why dogs,

and

F 2

cats,



cats, &c. when lying on the ground, and not in a warm situation, draw their limbs close to them, and endeavour to acquire such a posture of the whole body, as shall bring all the parts as much in contact as possible, and shall make their whole figure as small as it can be; and why, when in a contrary situation, as near a fire, or exposed to the warm rays of the sun, they stretch out their limbs, and extend their whole surface as much as possible: and we all know, that we ourselves, when naked, or when entering a cold bed, do exactly the same thing; and in bed, we continue such a posture until such a quantity of heat has been accumulated, and confined by the bed cloaths, as to remove the sensation of cold, when, like the before-mentioned animals, we stretch forth our limbs, and acquire our accustomed posture.

THE peculiar glow which follows cold bathing, and which is observed by persons  
soon

soon after coming into a warm room, when the body has been, for some time before, exposed to a very cold air, may, likewise, be accounted for on the same principles of the internal production of animal heat, and its tendency to the surface; for, as during the exposure to the cold, in both cases, the heat must have escaped very fast, and the supply have been proportionably quick, the waste being suddenly checked by the warm air being a bad conductor of the heat, there must, obviously, be an accumulation on the surface, and a greater sense of heat than before, for a while, until the balance between the waste and the supply be again more regularly restored.

THE effects produced by fanning, when persons are very hot, and its being suddenly left off, though lately accounted for, on the principle of a celebrated theory of spasm, may, I think, in a clearer and more simple manner be understood on the principles

principles of the foregoing doctrine: when the surface is so loaded with heat, and the air which is in immediate contact with it, has already taken up so much that it is either unable to carry off any more, or performs this office so slowly, as to be unequal to the removal of the quantity which is constantly arriving at the surface, the driving away such air by the fan, and permitting other air to approach, which not being so loaded, is able to carry off the heat more quickly, the skin must certainly be cooled; but if this operation be suddenly stopped, and the air again become stationary, the return of heat will take place, and for a little while, perhaps, in an increased degree, (as is usually observed,) because, whilst the heat had a free exit from without, the internal heat more readily found its way to the surface; and the fanning, which was the cause of the more free exit, being suddenly stopped, a greater accumulation, for a little while, takes place on the skin, as was observed under

under

under similar circumstances after cold bathing, &c. and it appears, then, very evident, that the operation of fanning promotes the escape of heat from the surface, on the same principle as the use of the bellows promotes the combustion of burning bodies, the one removing the air which is become too much loaded with the matter of heat, and the other that which is saturated with phlogiston.

THAT the heat from within arrives quickest at the surface of those parts from whence the greatest escape of heat is continually going on, is evident, from those parts, which are constantly exposed, not feeling colder than those which are covered; thus, except in very severe cold, the hands and face experience no greater sense of cold than the other parts of the body which are continually covered. From which it would seem, that nature endeavours to maintain a due equilibrium between the waste and supply of every part; and



and from this it may, also, be concluded, that if other parts of the body were as much exposed as the face and hands, that they would, but for a little while, experience any material inconvenience from the greater escape of heat which would be thus produced, and that, therefore, probably the use of such thick cloathing as we are accustomed to, or perhaps of any apparel at all, except in very cold climates and seasons, is principally necessary from habit alone.

EVERY one who has paid attention to the temperature of the atmosphere by means of the thermometer, must have observed, how frequently our feelings, respecting heat and cold, disagree with the indications of them, as expressed by that instrument; as it often happens, that when experiencing a very considerable degree of cold, we are surprised to find the mercury at a moderate temperature; and this may be observed usually to happen in windy weather,

weather, and when the air is particularly loaded with wet particles.

THIS is to be accounted for on no other principle than that of the constant production of heat within the animal, and of its tendency to pass off by the surface: for the thermometer very soon acquiring the temperature of the air, becomes at once stationary, varying only with the real changes which take place in the atmosphere; whereas, the constant succession of heat which there is in the living animal, prevents its acquiring the temperature of the air, and it cannot, therefore, like the mercury, descend to its temperature, and then become stationary; and as the sense of cold felt by us, must, consequently, be owing to the constant escape of heat which is thus promoted, the degree of cold must, obviously, be in proportion to the celerity with which the air is enabled to carry the heat off.

AIR in motion, though precisely of the same temperature as when still, will carry off most heat from the body in a given time ; because the portion of air in immediate contact with the body, does not remain long enough near it to be warmed to a degree that can much lessen its conducting power, but being immediately removed, its place is supplied by other portions, which are, likewise, in their turns driven away, and are again succeeded by others ; by which means the body is constantly surrounded with air of the coldest temperature the state of the atmosphere admits of, and which is, consequently, the most able to rob the surface of heat : whereas, when the air is still, the reverse of this must happen ; for if the portion of air remain for some time in contact with the warm body, it must soon acquire some of its warmth, and by approaching nearer its temperature, become proportionably less able to carry off heat from it than it did at first.

MOIST

MOIST air is, likewise, a better conductor of heat, than when dry, because, water, though of the same temperature with air, is well known to carry it off more quickly than air will do.

IF, therefore, when these two causes unite, as is the case in moist and windy weather, we may easily understand why the heat from animals should be carried off more quickly, and the animals should experience a greater sense of cold than when the air is still and dry, though the thermometer should, in both cases, stand at the same point.

THE matter of heat finds, moreover, other outlets to escape by, besides the surface of the body; as a considerable quantity must, evidently, pass off from the lungs in breathing, and from the bladder and intestines, with the urine and fæces: indeed, the quantity which is carried off with the air from the lungs, is found, by



experience, to be much greater than one would, at first, imagine, “*for we know that the heat contained in one breath of air, will, if properly managed, raise Fabrenheit’s thermometer ten degrees\*.*”

And nature seems to have taken advantage of this circumstance, when an extraordinary quantity of heat is suddenly excited in those animals, which are but little able to carry off such superabundancies : thus, dogs, who are seldom relieved by sweating, and sheep, whose cloathing is so particularly unfavourable to the carrying off an unusual quantity of heat, always breathe fast when much heated; they open their mouths, likewise, very wide, that the whole surface of the fauces may be exposed, and move the tongue remarkably quickly, to agitate the air in contact with it.

THE degree of heat lost by the two other causes must, obviously, depend upon the quantity of those evacuations; it is

\* See Critical Review for January, 1782, page 6.  
evident,

evident, however, from the circumstance of their carrying off any, that, independent of the generation of heat being lessened by emptying the bowels, as has been before remarked, the body is, likewise, cooled by these evacuations by the mere removal of sensible heat.

INDEPENDENT of the causes which generate heat in animal bodies, there are, undoubtedly, many which contribute to the sudden excitation of it: the principal and most powerful of these are exercise and a free motion of the different parts of the body; and this may be accounted for, by supposing that the decomposition of the food in the stomach is accelerated thereby, or at least that the diffusion of the heat which is there produced, is by these means hastened. We should then expect to find that those persons, who by working hard all day, promote a quick decomposition of their food, and by being constantly exposed to the cold air, and being thinly clad,

clad, suffer the heat which has been thus produced to escape fast, should have the best appetites, but that they should seldom grow fat; and for this reason it certainly may be accounted for, why the poor labourer, whose situation is precisely that just described, though he should always return from his work with a keen appetite, and should be able to satisfy it with full meals of the most substantial food, and should, in every respect, enjoy the most perfect health, yet that he should seldom, like his wealthy and indolent neighbour, become sleek and corpulent; the exercise and constant exposure to cold producing the same effects as habitual abstinence. It may be remarked, I believe, as a very singular circumstance, and as a striking proof of the foregoing observation, that there are very few instances of poor countrymen who live by daily labour, and are, for the most part, in the open air, being fat. And hence we see the propriety of air and exercise  
being

being recommended to invalids and convalescents, as the surest means of procuring good appetites; and why cold bathing should be particularly conducive to this purpose.

THAT the application of cold to the surface of the body, and particularly in cold bathing, is a powerful means of exciting the appetite, has been often observed by medical writers; and this circumstance has lately been accounted for, by supposing, that there is a peculiar consent between the muscular fibres of the stomach, and the muscular fibres of the extreme vessels on the surface of the body\*; and that as the surface is stimulated by the tonic and astringent power of cold, the nerves of the stomach are, by the consent of parts, exposed to the same influence, and the appetite is prompted by the stimulus thus communicated from with-

\* Cullen's First Lines of the Practice of Physic, vol. i. page 40.



out: but, surely, the explanation of this fact will be more simple, and more intelligible on the present theory. That immersion in cold water tends to carry off a much greater quantity of heat than would otherwise escape, must be very certain, and it must, therefore, evidently produce a more than usual necessity for the reproduction of this material; and as it is admitted that the sense of hunger, or a desire of supplying the stomach with food is the most obvious and general effect produced by cold bathing, it would seem very reasonable to suppose this organ to be principally concerned in the reproduction of it; and this is rendered still more probable, by the fact noticed in the preceding paragraph, and which proves, I think, incontestibly, that a waste of the matter of heat is a waste of nutriment, and consequently prevents those persons from growing fat, who are liable to a more than usual degree of it; and for this reason it also is, that those who go  
too

too frequently into the cold bath, or stay in it too long, usually shrink ; which circumstance must frequently have been observed in boys, who, from being fond of swimming, go very often into the water, and stay a long while in it.

THIS admits of still further probability, from its being, likewise, a fact, that the retention of heat is a retention of nutriment, and, therefore, renders a supply of food less requisite. This has been before remarked generally, and will appear yet more evident by the following facts, and which I adduce as particularly contrasted to the foregoing ones, which tend to prove that the waste of heat is a waste of nourishment.

THE employment of those artificers who work near large fires, and in places heated by furnaces, as blacksmiths, forgers, &c. is certainly more laborious than

H that

that of the husbandman ; and consequently, as far as depends upon exercise, the decomposition of their food, and the generation of heat must be carried on as quickly in them as in the husbandman ; but as they live constantly in a warm atmosphere, the heat so generated cannot so easily pass off, and which, therefore, according to the preceding theory, occasioning an accumulation of it, will be manifest in the increase of their fat : accordingly, it is not unusual to find such persons corpulent, and from the same circumstance, it probably is, that cooks are fat almost to a proverb \*.

## THE

\* THERE are, undoubtedly, many workmen, whose situations are, in many respects, similar to those above described, who are, nevertheless, very thin and pale ; there being circumstances which attend some employments of this kind, which necessarily injure the health and waste the body. In some, the labour and heat are so violent as to produce excessive sweats, as is the case with the workmen in glass houses, founderies, &c. and in smelting ores, and fusing some metals, it is well known, that arsenical and other noxious mineral particles are frequently taken into the habit, and very mischievous effects

THE common theory of the waste of animal fat, is, that it is rendered fluid by exercise and motion, and in this state is absorbed by the blood, from whence it passes off by the common outlets with the other excretions. Were this true, there would, obviously, be a greater waste of this substance in these artificers than in husbandmen, as on this principle, not only their extraordinary labour, but the very warmth of their situation would contribute to the dissolution of the fat; but whilst the contrary to this so often happens, it is surely more reasonable to suppose, as above, that the prevention of fat is owing to the matter of heat being easily carried off by exposure to cold when it is first generated, by which it is hindered from being deposited, and producing an increase of the bulk.

effects are produced by them. But these, however true they may be, prove nothing against the above general remark.



It must be, likewise, evident, that lying in bed, and being covered with thick cloaths, tends to retain heat, and consequently, that much less of the matter of heat must, at this time, escape, than under the ordinary circumstances of exposure. Those persons, who from accidents are obliged to be confined to bed for a considerable length of time, and those who, from indulgence, habituate themselves much to their beds, well know that the appetite is lessened by it; and every one's experience tells him, that the sense of hunger is much less induced during those hours of abstinence which pass in bed, than in the same number during the day.

It may, perhaps, seem a ludicrous remark, but I cannot help thinking, that the prevalence of corpulency among Dutchmen, is, in some measure, owing to the retention of heat; for though they certainly are not a slothful people, yet they

they are remarkable for being more warmly clad than any other nation.

FEW animals of equal bulk are capable of supporting life upon so small a quantity of food as sheep; as it is well known, that they will live, and even thrive in very barren pastures; and there are many instances of their remaining several weeks under deep snows without perishing: there can be no difficulty in explaining this, if the foregoing general principle be admitted, as it may, obviously, be attributed to their being covered with a cloathing of such great rarity as wool, and moreover, to the snow being so similar in its texture, as to be likewise a slow conductor of heat. And, for the same reason, it probably is, that sheep suffer so much more injury from an excess of rich food, than most other animals do, and especially in warmer climates: As the heat produced by a superfluous quantity of aliment cannot make its escape, they  
very

very soon grow fat ; and if still continuing the same rich food, they become subject to the various diseases of repletion, to cutaneous eruptions, &c \*,

A CIRCUMSTANCE of the same nature, may be also observed in birds, whose covering, like that of the sheep, is particularly well calculated to retain their heat, and therefore is, as has been before observed, well adapted to their unusually exposed situation. During the time of the incubation of the female, it is well known, that the smaller birds will remain a very long time without food : for, under these circumstances, not being exposed to such a waste of heat, as when passing swiftly and frequently through the higher and more cold regions of air in flying, a much smaller quantity than usual must consequently pass off, the necessity for an immediate supply become less urgent, and

\* Buffon's Natural History, English translation, vol. iii. page 468.

the sense of hunger, probably, be proportionably diminished.

THAT motion should produce an increase of heat in animals, may however, perhaps, be accounted for on another principle than its exciting a quicker action in the organs which decompose the food, or in those which diffuse it through the body; for if we admit the conjecture before made, that the matter of heat is deposited in a latent state in the animal substance itself, and most largely in the fat and cellular parts, it is not more unreasonable to suppose, that motion and exercise should call it forth on the principle of attrition, than that pressure and friction should call it forth from metallic and vegetable substances, for if it may be excited from iron by the strokes of the hammer, and from two sticks by rubbing them against each other, there can be no reason to suppose, that it should not be called forth by the same means from animal substances,

stances, which, probably, whilst in a living state, retain it more loosely.

THE soft, moist, and greasy texture of animal substance would, yet, seem to be very unfavourable to that closeness of contact, which in the attrition of harder bodies, probably, contributes much to the excitation of heat. I cannot more properly or more fully obviate this objection than in the words of Dr. Martine. “ Cum liquores omnes, & præsertim pingues, qualis est animalium sanguis, inter corpora dura intercepti eorum attritum quasi obtundant suffocentque, & calorem alias ex attritu oriundum multum imminuant; prout vel infimæ fortis hominibus notum est experimentis rotarum super axes, vel axium super fulcra in mille machinarum speciebus circumactarum; exinde ansam forte arripas irridendi productionem caloris a mutuo liquidorum & solidorum attritu in corpore animato. Quum præsertim  
“ habeamus



“ habeamus Villisium affèrentem liquida  
 “ utut plurimum concussa & agitata haud-  
 “ quaquam intepescere. Sed hypotheseos  
 “ amore abreptus fallabatur Villisius, nos-  
 “ que, si illi totos nos confidamus in er-  
 “ rorem abripiet. A quo simplicis rusti-  
 “ carum experimenti ope prompte libera-  
 “ bimur. Lactis quippe cremorem, li-  
 “ quorem certe satis inertem, & impense  
 “ oleosum jugi agitatione, conquaſſatione,  
 “ atque in continentis dolii parietes attritu  
 “ ad sensum tepeſcere norunt mulierculæ,  
 “ dum butyri a reliqua lactis parte ſepa-  
 “ rationem moliuntur. Idemque certiore  
 “ nota apud Albinum comprobatum video;  
 “ quum thermometer tunc temporis  
 “ lacti jam ebutyrato immiſſum majorem  
 “ caloris gradum evidenter commonſtret.  
 “ Hoc quidem ex mutatione quadam cre-  
 “ mori inducta, & quaſi chemico fieri pro-  
 “ ceſſu forte arbitraberis. Aſt, ſolicite  
 “ factò periculo, ipſam ſimplicem aquam  
 “ vehementer agitatam, fluidum in ther-  
 “ mometro paullulum elevaſſe ipſe obſer-  
 “ vaſſe mihi viſus ſum: niſi adquiſitum

“calorem alii cuidam ignotæ & latenti  
 “causæ ortum suum debuissè pertinax ni-  
 “mis adstruere volueris \*.”

THAT heat may be locally excited by these means, must, however, be known to every one, for the rubbing the hands together, will, certainly, call it forth without the rest of the body being moved, or without any other part being warmed by it; and, surely, this fact alone renders it very probable, that it is produced on the foregoing principle: and, if this be admitted, it obviously leads to another conjecture, namely, that the adipose parts of animals are not only useful as the general connecting medium of the other parts of the body, and by their softness, smoothness, and compressibility, as being well adapted to facilitate the various motions and flexions of the different parts, but that they serve the purpose of a magazine, in which the matter of heat is deposited, and from whence it may be occasionally

\* De animalium Calore, page 152.

called forth, for the use of the animal; and this supposition is not a little strengthened by several well known facts.

IT has been observed, that fat persons are less affected by exposure to cold than thin people are; the vulgar saying, of their fat keeping them warm, (at least if understood as furnishing them with warmth,) being, perhaps, more philosophical and true, than is commonly imagined; it is, however, undoubtedly true, that fat people are sooner affected by those circumstances which prevent the usual escape of heat from the surface, than thin people are, and that the accumulation of heat produced by those means, are more intolerable to them; and, it is equally true, that thin people are the most impatient of cold; old people, in whom, it is well known, this substance is so much diminished, require, and probably for this very reason, to be kept much warmer than young people; and it would seem, too,

that, in those persons, who from a general morbid state of the system, or from any particular disease in the stomach, are unable to take in, or digest the usual and necessary quantity of food, and consequently cannot derive the requisite supply of heat from this source, it is obtained from the adipose parts, these being the parts which are known to sustain the greatest injury under such circumstances.

I CANNOT help conjecturing, that what has been usually termed by medical writers, insensible perspiration, is, in some degree, the mere escape of the matter of heat; and, from what has before been observed, on the agreement between the generation of heat in the stomach, and the loss of it by the surface, we may well understand why, in those curious experiments which have been made, by accurately weighing the quantity of food admitted into the stomach, and the quantity which passes from the body by the common

mon emunctories, to ascertain the proportion they bear to each other, it has ever been found, that, in a state of health, the latter always falls very much short of the former; and which, therefore, proves that there is some other unknown outlet, and which has thence been called insensible perspiration.

THE calculations of the celebrated Santorius on this subject (which were, indeed, made in a warmer climate than that of England, as he lived in Italy,) prove, that if eight parts be admitted into the stomach as food, only three parts pass off by the bladder and intestines, and that, consequently, five parts make their escape by the other insensible outlet; a very great quantity indeed, the diminution of which, whatever be the nature of it, must necessarily produce a derangement in the animal œconomy.



SHOULD this conjecture have any truth in it, into what a practical error has the idea of this unknown and insensible matter, being perspiration, led medical people? for it is well known, that warm air and thick cloathing are usually recommended to prevent the suppression of insensible perspiration, whereas, the escape of the matter of heat from the body is certainly promoted by the surrounding air being colder than itself, and by any other substance being in contact with it, being good conductors of heat.

T H A T the escape of heat alone should effect any difference in the weight of the animal body, as is here supposed, must, however, appear very extraordinary; as we have no proof of the presence of the matter of heat adding to the weight of bodies.

I N E X P L I C A B L E as it may be, there certainly seems, in some instances, to be  
a difference

a difference in the weight of the component parts of a body, when under combination, and when separated, at least, when weighed under the common circumstances of the atmosphere; and, perhaps, the present circumstance of the diminution of weight, by the escape of heat from the animal body, may be of this nature.—The weight of the piece of charcoal, which was the subject of Dr. Priestley's extraordinary experiment with the burning lens, whatever it was, certainly appears to have exceeded the weight of the materials produced by its decomposition: this operation was carried on under circumstances in which none of its parts could be dissipated, except the light and heat, these alone being able to permeate the glass receiver; what remained was pure inflammable air, the weight of which, I need not observe, must have been much less than that of the charcoal.

THERE

THERE may, yet, be some fallacy in this, as, very possibly, inflammable air, light as it is, would, if weighed in vacuo, be equal in weight to the portion of charcoal which produces it; its extraordinary levity, when weighed in common air, being, perhaps, owing solely to its very great rarity\*: thus, if the charcoal, which produces it, could be extended to such a degree as to equal the rarity of inflammable air, it would, probably, have equal levity; and if, on the contrary, inflammable air could be reduced to the density of common air, it would, probably, weigh as much; or, if still further, to the density

\* THE obvious difficulty, if not impossibility, of ascertaining this by the air pump, or any other instrument, with perfect accuracy, must, for the present, at least, leave it a matter of conjecture; and, for the same reasons, probably, other philosophical paradoxes must still remain such. The increase of the weight of metals by calcination, which admits of no satisfactory explanation on the present principles of chemistry, might, perhaps, be accounted for, could the metal and calx be weighed in a perfect vacuum.

of

of charcoal, it would be as heavy as charcoal. And, possibly, it may be owing to the same circumstance, namely, its extraordinary rarity, that the matter of heat, when separated from the body with which it was originally combined, should seem to have no sensible weight: thus it cannot, surely, be unreasonable to suppose, that the matter of heat, which forms so material a part of some bodies, as coals, sulphur, &c. should contribute, when under combination, to their weight; and yet, when set at liberty by combustion, it is so extremely rare and unconfined, as not possibly to be the subject of any experiment to ascertain its weight, and, therefore, it has generally been supposed to have none.

THE principles into which the common articles of food, both animal and vegetable, are resolved by chemical analysis, are earth, water, air, phlogiston, and the matter of heat. The chief part of the earthy

K and

and watery particles pass off in the fœces and urine; but these, according to the experiments of Sanctorius, form but an inconsiderable part of the weight of the food admitted into the stomach. Some water, also, and, probably, more than is commonly imagined, evaporates from the surface of the mouth, fauces, and lungs in breathing, and some air, certainly escapes by eructation, &c. and I have no doubt, moreover, but that some moisture does escape insensibly from the skin, though I am persuaded it is much less than is commonly supposed, as I cannot help thinking, that what is deposited there, is principally designed for the purpose of preserving the requisite softness and smoothness of the surface, rather than to serve as the means of carrying off something from the habit \*. But all these together  
are

\* Were insensible perspiration equal to what Sanctorius has supposed it, it must, surely, be obvious to the sight in the form of vapor, as it passes from the skin,  
when



are insufficient to account for the weight of food received, and we must, therefore, have recourse to the only two other materials which are known to pass off from the system, and which are phlogiston and the matter of heat; (for I would take no notice of what is lost by sensible sweating, as that is, evidently, only an occasional discharge, and moreover, was not noticed in the calculations of Sanctorius) by which it appears, if the premises be admitted, that the matter of heat and phlogiston, little as they seem to contribute to the weight of bodies, must, in this instance, by their escape, be supposed to contribute something to the diminution of the weight of the animal body.

when the temperature of the air is so cold as to be incapable of retaining it in perfect solution; and which is so evident in breathing, even when the thermometer is upwards of 50. The surface of the skin, when brought in contact with a cold and smooth body, as a looking-glass, will, indeed, leave a mark of moisture, but even this is very inconsiderable, unless the skin be in a state of sensible perspiration.

IT is worth observing, how carefully nature has guarded against the inconveniencies which the temporary and occasional superabundances of heat, which, under certain circumstances, necessarily take place, must produce; when so large a quantity of heat is suddenly excited, that the surrounding medium cannot take it away sufficiently fast, or when, though the formation of heat be but in the ordinary degree, the temperature of the air is such, as not to be able to remove it in the usual manner, an accumulation must take place at the surface, and such a sense of heat be immediately felt on the skin, as to become painful, and if not soon relieved, to be injurious: in this case, provided the body be in health, there comes on a perspiration, which covering the surface with moisture, affords an opportunity for the heat to pass off by a new law, for evaporation at this time taking place, a quantity of heat is immediately absorbed by the vapor, and carried off in a latent state, by which means, the superabundant  
heat

heat finds an escape, and the inconveniences occasioned by it are obviated.

WITHOUT this happy provision of nature to carry off occasional superabundances of heat, it is obvious, that in hot climates it would frequently be insupportable; and accordingly it is observed, that in such climates those persons enjoy the most perfect health, and are able to endure the highest temperatures, who are most prone to sweating; and that particularly among those poor negroes who are compelled to perform hard and daily labour, those who are not constantly relieved by plentiful sweating, soon fall a sacrifice to the accumulated heat produced under those circumstances.

ON the same principle, how obviously does it appear, that the burning heat of a fever fit must be relieved by sweating, and that a state of perspiration must be salutary in all inflammatory diseases.

So great is the relief obtained by sweating in cases of extraordinary heat, that, probably, it contributes to the letting off the matter of heat by other means than the mere evaporation of the moisture which forms on the skin; it is evident, that sweating very much wastes the animal fat, and by that means, according to what has been before observed, one source of heat is diminished, and, perhaps, what passes off at this time is, in part, this very substance itself in a liquified state; and if so, the very change from a solid to a fluid must be attended with the absorption of heat, as it is well known, that those bodies which undergo changes from a solid to a fluid state are capable of retaining more heat in a latent state when fluid than when solid, as water contains more than ice, and vapor more than water. And I find, that I am not singular in this opinion, of the fat itself being sometimes liquified, and discharged through the pores of the skin; as Dr. Alexander, in his  
experimental

experimental essays, more than once mentions the same idea; for he says, “when  
“we view attentively the sweat of very  
“hard labourers, and of those who work  
“at furnaces, &c. and consider every cir-  
“cumstance attending it, we shall gene-  
“rally find that it is colliquative, and  
“consists chiefly of the serous parts of the  
“blood, but also of *the fat melted down*  
“*and excreted with them.*” Page 203.  
And in the same page he again says, “in  
“very profuse sweats, *a considerable part*  
“*of the fat is melted down and evacuated.*”

IF this be the case, we cannot but remark the peculiar simplicity with which nature relieves herself under these circumstances, the evil of accumulated heat becoming itself the cause by which the superabundance is removed: and hence we see, that a degree of heat, beyond what is usual to the skin, must take place before perspiration can be induced.

VARIOUS



VARIOUS other facts relative to the œconomy of animal life, might, I doubt not, be adduced as further illustrative of the foregoing theory; and in pursuing the subject, much matter would, probably, arise, not a little interesting to a philosophic mind, as it must necessarily open to the enquirer a new field of natural knowledge, perhaps, not less rich with materials, than those which have been lately so successfully traversed by modern philosophers. The short, and very imperfect sketch here given of the subject, will, however, I should hope, be sufficient to shew the probability of the system, and serve, at least, to introduce the following observations on the treatment of cutaneous eruptions and diseases of the surface: and if we admit this system, we must admire the wonderful simplicity with which nature carries on the important work of the production of heat in animals, and her great wisdom, in not  
only

only having provided such ample stores of this valuable material, in different parts of the creation, but in having so perfectly secured it from waste until it should be called for by the occasion which immediately demands it; for, were the matter of heat contained in seeds destined for future plants, or in other vegetable substances intended for the use of animals, so loosely combined with them, as to be sensible to the common laws of heat, it is evident, that the matter would be dissipated as soon as the respective bodies were surrounded by media, colder than those in which they were originally formed, and, consequently, would be expended before, in one case, the great purpose of vegetation, and in the other, the no less important work of animalization could be effected,

## SECTION II.

*General Theory of Cutaneous Eruptions, &c.*

WHETHER the philosophical reader will admit the preceding theory of the production of animal heat to be probable or not, the foregoing facts are certainly sufficient to prove, that a considerable quantity of heat is constantly generated in the animal body, and that some of it has a constant tendency to pass off by the surface ; that the regular escape of this matter depends upon such various circumstances, that it must be liable to occasional interruptions ; and that in consequence of these interruptions, the surface of the skin must be sometimes overcharged with heat.

THE

THE effect of this accumulation of heat from within, if we may be allowed to consider the fact simply, must be precisely the same as if an extraordinary quantity of heat were to be applied to the skin from without; and which is well known to be as follows: a small degree of heat, and which is not long continued, excites only an increased sensibility in the part; if a larger quantity, or if longer continued, it occasions a sense of burning, the part becomes red, is inflamed, and tumefied, perhaps, by the simple expansive power of heat; and if still more be applied, the circulation in the cutis is obstructed, and a decomposition takes place, which is attended either with the vesication or exulceration of the part.

THAT there are various diseases which affect the skin exactly in the way just described, the causes of which cannot be the application of heat from without, must, I think, be admitted by every person who

has paid the least attention to cutaneous affections, and from their great similitude to those which are produced by the action of external heat, afford a fair presumption, that they are produced by a real accumulation of the same matter, and which, consequently, must have its source from within.

WHAT renders this still more probable, is, that those subjects in whom the greatest quantity of heat is known to be generated, are most liable to cutaneous diseases, as is, in both respects, the case with infants; and that those parts of them whose situation is the least favourable for the escape of heat, are the first and most principally affected: it is obvious, that the matter of heat is most likely to be retained behind the ears, under the axillæ, &c. as these parts are almost constantly in a state of contact, and it is well known, that these are particularly subject to excoriations and pustular eruptions.

I CANNOT



## CUTANEOUS ERUPTIONS, &c. 77

I CANNOT help, therefore, thinking, that most of those eruptions and inflammations on the skin, which occur when a patient is in other respects in good health, are owing merely to the matter of heat accumulated on the part, in consequence of its being obstructed in its usual endeavour to pass off; and in support of this opinion, I will adduce two simple instances of such local eruptions being, incontestibly, produced by such an accumulation: in the one case being occasioned by the matter of heat being hindered from making its escape as usual; and in the other, by such an extraordinary quantity being excited on the part as cannot pass off in the ordinary way.

IT is well known, that poultices, which, from their loose and rare texture, are evidently very bad conductors of heat, if long continued to a part, rarely fail to produce pimples; and that friction, even of the most gentle kind, will, if long continued,

or

or often repeated on a part, produce the same; and an instance of the latter, as occurring in medical practice, may be observed in those patients who have been for some time using mercurial frictions, especially if the ointment be absorbed so slowly as to require a long continued rubbing on the skin; the pustules on the part produced by this cause, being, sometimes, so troublesome as to make it necessary that the patient should frequently change the part on which the friction is made, and even in some cases, as to require the discontinuance of it for some time: and we all know, how much sooner these causes, when united, will produce the foregoing effects. The uneasiness which some people experience when riding in warm weather, is certainly produced by an extraordinary degree of heat being excited on the part by pressure and friction, and by the due escape of it being prevented by the substances in contact being bad conductors of heat.

## CUTANEOUS ERUPTIONS, &c. 79

IF, then, this simple view of the substance be admitted as a just one, we cannot be at a loss how to treat such diseases, the very nature of them pointing out those substances which have the property of carrying off the matter of heat most readily, as the most likely to afford relief in them.

THE similarity between topical inflammation, and the effects of external heat applied to the skin, and the real existence of an extraordinary degree of the matter of heat in the former, have long ago been remarked by physicians, and are particularly noticed by the celebrated commentator on Boerhaave, who has the following apposite observations on this subject \*.

“ BUT that there is a greater quantity of  
“ fire in the inflamed part is demonstrated  
“ by thermometers, and the effects being  
“ quite similar to those which arise from

\* Van Swieten's Commentaries, vol. iii. page 284.

“ the

“ the application of elemental fire to the  
 “ body. For when a healthy person ap-  
 “ plies the back of his hand to a fire, he  
 “ begins to perceive a greater heat, then  
 “ the part will become red: and if he  
 “ applies it still nearer to the fire, the  
 “ pain will be violently increased, the  
 “ cuticle will be raised into blisters, and  
 “ at length the skin itself will be burnt  
 “ up into an eschar by the increased ac-  
 “ tion of the fire; which eschar being  
 “ absolutely a dead or foreign substance,  
 “ must be separated from the living parts  
 “ by a suppuration: but the ill conse-  
 “ quences of an inflammation are altogether  
 “ the same with these, and arise in like  
 “ order. For a slight heat, redness, and  
 “ tumour, attended with pain, form an  
 “ inflammation at the back of the hand,  
 “ all which symptoms have increased in  
 “ proportion to the disorder itself: but  
 “ from a violent inflammation tending to  
 “ a gangrene, the cuticle is also raised into  
 “ blisters, and gangrenous eschars are  
 “ formed,

# CUTANEOUS ERUPTIONS, &c. 81

“ formed, which must be likewise separated from the living parts by suppuration; and if the inflammation still continues increasing in violence, all the parts appear black, even to the bone, in the same manner as if they were burnt by the fire, and then the part is said to be mortified or sphacelated. Hence, also, Hippocrates calls an ardent fever by the name of fire (*το πυρ*) because, in that disorder there is often so great a heat felt in the vital organs, as if there were a real fire; from whence death often ensues very suddenly. And in the most ardent fever, the plague, when the malignity of the distemper is translated to some particular part of the body, it is observed to be burnt up in such a manner as if it was actually occasioned by fire; as is evident in the pestilential carbuncles; which are, afterwards, separated and thrown off by a suppuration all round them, and this perfectly in the same manner as is usual

M

“ when



“ when any part of the body has been  
“ burnt by a red hot iron. Thus the  
“ wise ancients did, by observations only  
“ of the effects of an inflammation, deno-  
“ minate it justly from fire, since both  
“ the cause and the effect of each are alike ;  
“ and the modern observations concern-  
“ ing the nature of fire, are a strong  
“ confirmation of all that has been here  
“ said.”

THE inflammation which spreads round the puncture of inoculation, is, perhaps, of all others, the most intense ; but as it is usually but of short duration, and, as when there are but few pustules in the other parts of the body, its continuance is rather desired than not, means are seldom used to lessen it. I have, however, sometimes seen it so great as to destroy the integuments and cellular substance to a considerable extent and depth. When threatening such effects as these, the keeping the part constantly wet with cold  
water

water, relieves it sooner than any other application; and this method, which I first learned from Mr. Sutton, the celebrated inoculator of the small pox, and the bold and successful introducer of the cool regimen in that disease, is a decisive proof of the relief obtained in inflammations by the simple removal of the matter of heat.

ADOPTING, therefore, this general idea, that cutaneous eruptions and inflammations are produced by accumulations of heat on the surface, and that they indicate the necessity of a more speedy removal of the matter of heat than the part requires at another time, I shall endeavour to enquire, whether the same doctrine be not applicable to the following important diseases, and whether, as in all of them, the surface most particularly suffers, it is not reasonable to attribute them to similar accumulations, and to suppose, there-

fore, that they may, all, in some degree, be relieved by the use of those means which have a tendency to prevent such accumulations of heat being formed on the surface, or to assist in a more speedy removal of them, when once collected.

THE diseases I allude to are the following :

The Small Pox.

The Miliary Eruption.

The Measles.

The Scarlatina.

The Erysipelas.

The Elephantiasis.

The Tinea Capitis.

Febrile Rashes.

The Anthrax.

The Phlegmon.

Burns and Scalds.

Spreading Ulcers, attended with an extraordinary sense of heat.

The Hernia Humoralis.

The

CUTANEOUS ERUPTIONS, &c. 85

The Hernia Intestinalis.

Ophthalmia.

The Gout.

And those kinds of local eruptions and excoriations which cannot be included in any of the above.

SECTION

## SECTION III.

*The Small Pox.*

WHAT is the peculiar nature of the virus of the small pox, and whether we shall ever be able to understand the nature of this, and of the other species of contagion, it is not at present necessary to consider: it is, however, evident, that its introduction into the system never fails to produce a peculiar kind of ferment in it, and that the effect of this is the generation of an extraordinary quantity of heat, which, by a powerful effort of nature, is immediately determined to the surface, and in proportion to the quantity which arrives there, or that is prevented from passing off, the skin suffers the usual injury from such cause, as an increased sensibility in the part, redness, tumefaction, and suppuration.

THIS



THIS view of the disease, simple as it is, I am persuaded is a very natural and obvious one, and is, in the fullest manner, proved to be a just one, by the method which modern practice has adopted of treating it; for however the original introduction of such a method may have been owing to that kind of happy chance, which in many instances of human improvements has brought about the most useful discoveries, and however little, therefore, the principle of it might, at that time, have been reasoned upon, there can be no doubt but the salutary effects which experience has found to be produced by it, depend totally upon its favouring that escape of the matter of heat which the disease so immediately indicates to be necessary, and an endeavour to carry off which, seems to constitute its very nature.

THE extraordinary success which has attended the exposure of patients in the  
eruptive.

eruptive stage of this disease to the cold air, and of their regimen, for some time before the fermentation excited by the introduction of the variolous matter takes place, being such as affords the most moderate generation of heat, are the most striking illustrations of the foregoing general doctrine, and particularly prove, that this disease consists principally in a superabundance of heat suddenly excited.

THE very painful and feverish state of this disease which precedes the eruption, is, probably, owing to the peculiar fermenting process brought on by the admission of the virus into the habit, and, perhaps, the general sense of heat within, the pain in the head and back, the uneasiness and nausea at the stomach, and the increased velocity of the blood, are all symptoms of the intestine motion of such a process; and thence it may, likewise, seem not extraordinary, that when this is finished, and the heat which is generated  
from

from such an operation is set at liberty, and finds its way to the surface, that the foregoing symptoms should immediately be alleviated; and further, that if the heat should find a very ready issue, and be in a great measure dissipated, that the danger of the disease should be over: and that if, on the other hand, when the heat arrives at the surface, it should be prevented from passing off, or if the quantity of it be so great that the quickest conductors of heat should be insufficient to its removal, that it must accumulate there, and, in proportion to its quantum, produce upon the skin all the effects of such an accumulation of heat, as have before been enumerated.

THIS disease may, therefore, be well considered as consisting of three distinct stages; the first is that which is called the eruptive fever, and which appears to be occasioned by the peculiar ferment just mentioned; the second, which is pro-

N

perly

perly termed the eruption, and which appears, evidently, to be owing to an extraordinary quantity of heat being thrown on the surface; and the third may be considered as the effect of that injury which the part has sustained by such an overcharge of heat, and consists in the pustular suppuration of the skin.

It is thence obvious, that the danger of this disease arises principally from the quantity of heat which has been excited in the first stage, and from the degree of obstruction which it finds in endeavouring to pass off in the second; and that, therefore, the regulation of these two stages is the most within our power; the object of the first being to render the habit able to endure, with the least injury, the derangement which the whole system suffers from this peculiar kind of stimulus being introduced, and by diminishing, as much as possible, the generation of that heat which is the effect of it; and both which, as before

fore observed, are most likely to be accomplished by unloading the stomach and bowels of such materials as give out much of the matter of heat, and by admitting such food only as affords the most moderate quantity of it in its decomposition; and the object of the second being to favour the escape of heat from the surface; which is obtained by thin cloathing, exposure to cold air, &c. The first of these having been, by experience, found as instrumental in lessening the violence of the disease as the second, I wish the reader particularly to advert to it, as this seems to depend very much upon the restraining the generation of animal heat at that time, by diminishing the quantity of the materials which are supposed to produce it; for I cannot help thinking, that the use of preparatory medicines which are given previous to the communication of this disease by inoculation, depends more upon their power of emptying the bowels as purges, than



upon any specific antivariolous quality inherent in mercury, antimony, &c.

WHEN the third stage of this disease has taken place, the mischief, perhaps, is, in a great measure, irreparable; and all that art can do, is to conduct the patient through it as well as circumstances will admit of; for if the surface have suffered so much from the degree of heat accumulated upon it, that suppuration must take place, the object of medicine must be to prevent, if possible, the still more unfavourable termination of gangrene: The situation of an unhappy patient under these circumstances being, perhaps, very similar to that which would take place if the skin had been injured to the same degree by artificial heat from without; and every one knows the hazard which would arise from such an affection of the skin, even from that cause, if extended over so large a surface.

MUCH

MUCH, however, as the danger of the small pox seems to depend upon the quantity of heat excited in the first stage of the disease, and much as its virulence is diminished by the heat being carried off freely in the second, yet there can be no doubt, but something, in which the variolous poison resides, is deposited on the skin with the matter of heat; as it is well known, that the matter which is formed by the suppuration of the part, and even the clear lymph, called ichor, which (like the water of a common blister,) is found when the pustule is a mere vesicle, have the power of communicating the distemper; yet even this, little as we can reason upon its nature, is certainly so proportioned to the quantity of heat excited at the time of its production, that it cannot, separately, be considered as an object of medical attention; and were it even supposed, that the heat was not generated within the body, and determined to the surface, but  
that

that it was immediately excited on the skin by the acrimony of the variolous matter deposited there, the same endeavour to carry it off by exposure, &c. would be equally indicated.

THE small pox is a disease so well known, and the method of treating it with the cool regimen is at present so universal, that every practitioner must have had sufficient experience of the facts on which the foregoing remarks are founded; but as it may serve to strengthen what I have advanced on the subject of heat, as applied to the treatment of this disease; I shall insert the following transcripts on this subject from *Cullen's First Lines of the Practice of Physic*,

“ THE circumstance of the skin, which  
 “ seems to determine the variolous matter  
 “ to stick in it, is a certain state of in-  
 “ flammation, depending much upon the  
 “ heat of it; Thus we have many in-  
 “ stances

“stances of parts of the body, from being  
“more *heated*, having a greater number  
“of pustules than other parts. In the  
“present practice of inoculation, in  
“which few pustules are produced,  
“much seems to be owing to the care  
“that is taken to keep the skin *cool*. Parts  
“covered with plasters, especially with  
“those of a stimulant kind, have more  
“pustules than other parts. Farther,  
“certain circumstances, such as adult  
“age, and full living, determining to a  
“phlogistic diathesis, seem to produce a  
“greater number of pustules \*.” And  
further, on the subject of inoculation,  
the same author says, “That it is neces-  
“sary both before and after inoculation,  
“to avoid external *heat*, either from  
“sun, artificial fires, warm chambers,  
“much cloathing, or being much in bed;  
“and on the contrary, that it is right

\* Page 143, vol. ii. 4th edition.

“ to expose the person to a free and *cool*  
“ air †.”

THE method of treating the small pox, which the above theory of the disease so obviously points out, being such as modern practice has already so successfully adopted, what has been said on the subject must be considered rather as illustrative of the preceding doctrine of heat, than as tending to recommend a new mode of practice: but as the above theory, perhaps, more fully explains the principle upon which such a practice is salutary, it may possibly be thought right in some cases to extend the degree of its application, and when the circumstances attendant on the eruption indicate such an accumulation of heat on the skin, as must be peculiarly hazardous, to attempt its dissipation by the application of more powerful conductors to the surface than

† Page 148.

have



have hitherto been made use of; for if the temperature of the air be such as to render it unable to carry it off sufficiently fast, it would not seem improper to make use of water, which is known to conduct heat more quickly, or even to profit by the still more active heat-conducting power of evaporation, in the use of a more volatile fluid; provided the texture of the skin be not in any degree broken, so as to expose it to the danger of being stimulated by it.

## SECTION IV.

*The Miliary Eruption.*

**T**HE miliary eruption is another very remarkable instance of the effect of an accumulation of heat on the surface; for though considered for a long time as a critical evacuation of febrile matter, and constituting a peculiar disease, modern practitioners, I believe, are unanimous in attributing it solely to the skin having suffered a long continued and preternatural degree of heat and sweating.

**T**HAT these eruptions are produced by the before mentioned causes, may be presumed from their infrequency in fevers of the most malignant kind, and even among puerperal women, (who have heretofore been supposed to be so peculiarly liable to them,) since the cool regimen has been generally adopted in practice;

practice; from their being sometimes produced by those causes, when the patient is totally free from fever, and moreover from their being sometimes merely local, as must have been observed, not infrequently, where a part has been a long time kept warm and moist by poultices.

IN the course of my practice, and which, more particularly in puerperal cases, has not been inconsiderable, I have never once seen the miliary fever; but I have several times observed a plentiful crop of the miliary eruption surround the female breast, when, on account of a suppuration, it has been necessary to keep it poulticed for any length of time; and I have sometimes seen them on the chests of children, in very hot weather, though they have been in perfect health, from their having sweated profusely, and having had rather too thick cloathing upon them.

WERE it necessary, in further proof of these eruptions being produced by heat and

sweating, to produce the authority of medical writers on the subject, I have no doubt but the most ample testimony might be obtained from the modern ones: the following, however, being so strikingly apposite to the subject, appear to be fully sufficient for my purpose. Dr. Shebbeare, who wrote before the cool regimen was generally made use of, and who was well known to be no friend to it, speaking of the miliary eruption, says, “Increased sweating, and long continued heat often exhibit that phænomenon, where no sickness attends.”—*Practice of Physic, Vol. II. Page 144.*

IN Mr. White's excellent *Treatise on the Management of Lying in Women*, the nature of the miliary fever is fully described, and the most satisfactory proofs are given of the eruption being produced by a mere overcharge of heat; he says, “I have often seen miliary eruptions at different periods and under different circumstances, but I cannot, upon the strictest enquiry, find, that a  
“ miliary

“ miliary eruption was ever produced with-  
“ out a *sweat*.” And further, “ I have  
“ often observed that the miliary eruptions  
“ come out first, and there is the greatest  
“ quantity of them in those parts which  
“ are the closest covered, especially if co-  
“ vered with flannel.”—Page 44. *Second*  
*Edition.*

Dr. Gregory, in his *Practice of Physic*,  
says, “ It is found in all kinds of fevers,  
“ especially where a *hot* regimen has been  
“ used, and where profuse and long continued  
“ sweatings have been the consequence.  
“ Many people have it when they sweat,  
“ though they have no fever.—Page 92.  
*Seet. CLXXII.*

And Dr. Cullen, in his *First Lines of the*  
*Practice of Physic*, delivers an opinion on this  
subject perfectly similar to the foregoing; for  
he says, Page 108. *Seet. DCLXXXVII.*  
“ That it is very probable, that, in the mi-  
“ liary fever, the morbid matter is not a  
subsisting



“ subsisting contagion communicated to the  
 “ blood, and thence, in consequence of fe-  
 “ ver and assimilation, thrown out upon the  
 “ surface of the body, but a matter occa-  
 “ sionally produced in the skin itself by  
 “ sweating.” And *Page* 111. *Section*  
 DCLXXXIX. “ It appears so clearly to  
 “ me that this eruption is always a sympto-  
 “ matic and factitious affection, that I am  
 “ persuaded it may be, in most cases, pre-  
 “ vented merely by avoiding sweats.”

And further. *Page* 113. *Sect.* DCXC.  
 “ We are persuaded, therefore, that the prac-  
 “ tice which formerly prevailed, in the case of  
 “ miliary eruptions, of covering up the body  
 “ close, and both by external means and in-  
 “ ternal remedies, encouraging the sweat-  
 “ ings which accompany this eruption, was  
 “ highly pernicious and commonly fatal.”

THIS eruption appears, therefore, most  
 unquestionably, to arise from an extraordinary  
 degree of heat being collected on the surface,  
 under

under the peculiar circumstance of considerable sweating accompanying it; for in all the cases of miliary eruption before alluded to, it seems, in none of them, to have been excited without the latter having been an attendant upon it.—This may, probably, at the first view appear a paradox, as sweating has been before considered, and is by experience well known, to be a very powerful agent in removing heat from the skin; but as this must obviously arise from the evaporation of the fluid deposited by sweating, if a profuse sweat be induced under circumstances which very little favor its evaporation, it is not unlikely but the heat of the skin will not only be but in a small degree lessened, but that it, possibly, may sometimes be increased by it; and as evaporation cannot take place to any extent, if the external air have no access to the skin, and which must be the case when the body is closely surrounded with flannels and thick bed-cloaths, it may, perhaps, in some measure, be accounted

counted for why this phænomenon should be produced by the joint causes of accumulated heat and sweating, when the skin is thus closely covered and cautiously guarded against the contact of the outward air,

IF we admit the foregoing conjecture, we may further learn that not only profuse sweats, which, under these circumstances, are excited on the principle of carrying off morbid matter, are generally prejudicial, but even the more moderate ones, which are induced with the intention of relieving the surface on the principle of diminishing its heat, must, in a great measure fail of their purpose, if the evaporation of the moisture be not promoted by a due admission of the external air.

IT can scarce be necessary to add, that allowing the cause of miliary eruptions to be such as has been recited, the cool regimen must be the only sure method of preventing them; and that when, from a contrary practice

tice

tice having been pursued, they have taken place, it must be equally manifest that the usual means of letting off heat from the skin, by occasional exposure to cool air and by thin cloathing, may not only be safely adopted, but that they must be the most likely to obviate the ill effects of them, and to prevent the production of any more.

## SECTION V.

*The Measles.*

**T**HIS disease, like the small pox, depends upon a specific contagion communicated to the blood, by the peculiar operation of which, on the system, fever and an extraordinary degree of heat are excited; the latter of which being determined to the surface, produces an accumulation of heat there, and occasions an eruption, which constitutes a principal part of the disease. It differs, however, from the small pox in this, that the skin does not seem to receive all the virulence of the distemper, as the lungs, and the mucous membranes of the throat, nostrils, &c. are more particularly affected by it; and for this reason, perhaps, it is, that the symptoms which occur before the eruption, are not so much relieved by its appearance as in the small pox.

It



IT is evident, however, that the surface is very much overcharged with heat, which undoubtedly has the same tendency to pass off, as in other similar accumulations; and if we may be permitted to judge, from its analogy to the small pox, in this respect, and the great use with which the letting off the heat has been attended in that disease, we may surely expect some advantage from the same means being adopted in this, with this obvious difference only, that as exposure to cold is supposed to aggravate pulmonary affections which arise from inflammation, such means should be more cautiously exhibited.

ON this account there is, perhaps, no way in which the escape of heat from the surface, could, in this disease, be promoted more advantageously, and with less inconvenience to the pneumonic symptoms, as by moderate sweating; but as nature seldom affords such a relief in the eruptive stage of this and similar eruptions, we may presume,

that the common means for this purpose, such as the neutral medicines, tepid, diluent drinks, &c. will not easily produce it; and if they would, that probably their operation would be too slow, where the effect is so immediately necessary; and as this reluctance of the skin to perspiration is, at this time, probably, owing to its being parched and corrugated by the heat accumulated on it, no means seem so likely to excite it as the tepid bath, or the application of flannels wrung out of warm water; both which are well known frequently to have induced it when the usual internal methods have failed.

THE warm bath, if at a moderate temperature, would seem, however, to deserve the preference in this case; as, independent of its tendency to promote sweating by relaxing the skin, and rendering its pores more pervious to the perspirable fluid, it certainly has a tendency to relieve the surface in the first instance, by its power, as water, of conducting heat, and which is found by thermometrical experiments

experiments to be so considerable, even when at a temperature much higher than that of the surrounding air, provided it be lower than that of the body which is immersed in it, that it will still deprive it of heat faster than the air would do at a much lower temperature.

THOUGH the heat on the surface would, in all probability, be considerably diminished by this method of practice, and though the nature of the disease is, obviously, such as to give us room to expect relief from such a diminution of heat, yet I can hardly suppose that the medical practitioner would be induced, from what has been said, at once, to adopt such a practice, unless some proofs, from experience, could be given of its salutary tendency. Persuaded, however, as I may myself be of the good effects which would probably attend the immersion of the whole body in a bath moderately tepid, at the time of the eruption of the measles, and more especially, satisfied as I am, that it could do no harm,

I would

I would yet advise, at first, as an experiment, to put the feet and legs only into warm water: It is well known that this partial use of the bath frequently induces a general and sufficient perspiration; and surely the practice of putting the feet into warm water is, at this time, so common at the beginning of most inflammatory fevers, that no one can consider its proposed use in the measles as likely to be injurious; and should it be found by experience to lessen the heat on the surface, and to alleviate the febrile symptoms, there is no doubt but the practice would soon be carried to a greater extent, by immersing the whole body in the tepid bath.

FROM what was observed in the preceding section on the subject of sweating, it is obvious that when the above, or any similar means, are used to promote perspiration, with a view to the lessening the heat on the surface, that it will be peculiarly requisite to guard against the patient being in too warm an atmosphere, or being too much covered with  
bed-

bed-cloaths or thick apparel, and more especially, because in this case the want of perspiration cannot be occasioned by a deficiency of heat on the skin.

IN contagious diseases, attended with eruption, though the nature of the poison, the principle on which it affects the system, and the mode by which it passes off are totally concealed from us, yet medical practitioners seem to have adopted an idea of the quantum of virus bearing a proportion to the visible eruption; and that, as that appears to be the only sensible outlet by which it escapes from the constitution, the diminution of it, when once it has made its appearance, would seem to check the escape of morbid matter.

THERE is evidently a seeming propriety in this mode of reasoning; and we cannot, therefore, wonder that the treatment of cutaneous diseases has hitherto been so much directed to promote that which was considered as the visible outlet of the distemper.

Nothing



Nothing less than the experience of repeated facts could have proved the absurdity of a mode of reasoning seemingly so proper. In the small pox this has actually taken place, and, as far as relates to that single disease, it has had its full influence on practice.

ONE would have expected that the application of these important facts would have been extended, in some degree, to the treatment of the other cutaneous diseases which so much resemble the small pox: but there is evidently a reluctance in medical persons to admit such an analogy between them as would influence the practice: and we find, therefore, that one of the latest and most distinguished medical writers\* distrusts the analogy between the small pox and the measles, and even apprehends that exposure to cold might check the escape of the disease, and throw it back into the system.

\* Dr. Cullen.

I CANNOT account for this otherwise than by supposing that the principle, or, if I may be allowed the expression, the theory of these facts has not been sufficiently understood; for I have before observed, that though the good effects of exposure to cold in the small pox have been sufficiently ascertained by experiment, yet the reason for it has been but little attended to.

THE use of certain medicines, and the exposure to cold, have been supposed to act specifically in the extinction of the virus of the small pox; and whilst the matter rests here, it follows clearly, that unless the virus of the measles be admitted to be very similar to that of the small pox, there is no more reason to expect that the same means should be specifics in the removal of the former, because they are in the latter, than that it is reasonable to expect that mercury should subdue the cancerous virus because it is known to be a specific in the venereal.

Q BUT

BUT if we admit the probability of the conjecture, which obviously arises from the consideration of the foregoing theory of heat, and of the before mentioned facts relative to the small pox, namely, that the quantum of the eruption bears a near relation to the degree of heat excited in the system, and retained on the surface, and that the removal of the former is in proportion to the diminution of the latter; or, to place the subject in a still more simple point of view, that the disease is not so much in proportion to the quantity or individual nature of the poison admitted, as to the state and disposition of the body, respecting the generation of heat, and to the situation of the patient, as favourable or unfavourable to the escape of it from the surface, we may, surely, from the clearest analogical reasoning, infer, that in any other disease, the nature of whose contagion is ever so different to that of the small pox, if its introduction into the system occasion the excitation of an extraordinary degree of heat, and a cutaneous eruption in consequence of its accumulating on  
the

the surface, that those means which tend to repress the generation of it in the first instance, and to favor its escape in the second, must be equally salutary in the one disease as in the other; and for the same plain reason which would direct the use of the very same means to extinguish a fire, whatever was the peculiar nature of the inflammable body which first kindled it,

THIS further view of the subject, I think, then, still more strongly shews the propriety of the cool regimen in the measles; and, probably, did not the pulmonary symptoms which usually attend it, forbid its application to such an extent as in the small pox, (though, possibly, future practice may prove that our apprehensions from exposure to cold, are, even in this respect, ill founded), and if, as in the small pox, the disease could be anticipated, so as to allow of the habit being prepared to receive the contagion, it might be rendered equally mild and free from hazard,

## SECTION VI.

*The Scarlatina.*

**T**HOUGH the scarlet fever is, in many instances, accompanied with a fore throat, and some other symptoms which may require a peculiar mode of medical treatment, yet the principal symptom of this disease indicating an extraordinary determination of heat to the surface, seems particularly to require the liberal use of those means which favor its escape.

THE tumefaction, and fiery appearance of the skin, the sense of intolerable heat, which patients in this disease never fail to complain of on this part, and the evident injury which the cutis sustains, are decisive proofs of an accumulation of heat upon it.

THIS



THIS disease is more frequent and more violent in children than in adults, perhaps because the natural heat of their bodies exceeding that of grown up persons, disposes them more readily to receive the contagion, and admits of a greater excitation of heat from its introduction.

PATIENTS laboring under this disease are seldom known to sweat; and if we admit Dr. Alexander's theory of sweating, we may reasonably suppose that, in this case, it is prevented by the surface being heated beyond the sweating point.

IT follows then, I think, pretty clearly, from these premises, that the most obvious mode of relief in this disease, must be to assist in carrying off that superabundance of heat from the surface, which, under the ordinary circumstances attendant on the treatment of it, namely, warm rooms and thick bed-cloaths, nature seems unable to effect; and I have, therefore, scarce any doubt, but  
thin

thin cloathing, exposure to cool air, and, perhaps, the temperate bath, would be very useful, if applied in the early stage of it.

IT is, I believe, a constant practice to unload the stomach and bowels at the first attack of the complaint; and this is evidently right, both on the principle of the foregoing theory, as removing one source of the generation of heat, and as having been, by experience, ever found salutary at the beginning of all febrile complaints. But when this fever is attended with the sore throat, and the eruption is particularly great, it has been observed that patients seldom bear the continuance of such an evacuation.—The reason, perhaps, is, that when the heat is excessive, unless it finds a ready escape when it first arrives at the surface, that its mischievous effects are very soon felt; and the future treatment must be directed to prevent (as was observed with regard to the small pox) the termination in putrefaction or gangrene.

SECTION

## SECTION VII.

*The Erysipelas.*

**T**HAT the erysipelas is a disease of the skin, attended with a peculiar degree of heat, is evident from its very name.—Ignis facer, and St. Anthony's fire, both sufficiently express this idea; and there is no doubt but these, and similar names, were originally made use of as descriptive of the patient's sense of the part affected.

THE mode of treatment which, in the earliest ages of medicine, was adopted in this disease, was, likewise, on the principle of removing the fire from the part. Cooling applications, and even cold water itself having been

been recommended by Hippocrates and Galen; and the testimony of the earliest writers prove that such applications seldom failed to remove this disease when applied at the beginning of it, having obviously afforded a very ready outlet to the matter of heat as it arrived at the surface.

THIS practice prevailed for some time, until an idea was conceived that, in most cases of this disease, and more especially when it was situated on some peculiar parts of the body, it was an effort of nature to throw off morbid matter, and that, therefore, the supposed repelling principle of cold applications, by throwing it back into the system, might be hazardous: and this was the more readily believed from observing, that, if left to itself, it usually terminated in a slight supuration; by means of which it was imagined the diseased matter was carried off; and for this reason it became the practice to keep the part warmer, and to use oily applications, poultices,

poultices, &c. as most conducive to digestion.—Those applications have again given way to saturnine lotions, and even the use of dry farinaceous powders, both which are the remedies of the present day, from a supposition that greasy unguents soon acquire acrimony, and tend to make the erysipelas spread and exulcerate.

SATURNINE lotions, I believe, have been found very useful in these and similar eruptions, but I cannot help thinking that the good effects which have been attributed to this medicine, have been more owing to the watery menstruum in which it is usually exhibited, than to any salutary quality in the lead itself; for though this metal is said to possess a sedative, repellent, and astringent property, and though much ingenious reasoning has been made use of to account for its action as a topic on those principles, yet I believe it remains to be proved whether it possesses these qualities to a degree that could

R

be



be much felt in the usual mode of its application; and if it did, I much doubt whether they would be salutary in the present disease.

THE principal use of lotions and cold applications in these cases, appears to me to have been simply derived from their power of carrying off heat; and the reason why warm and greasy applications, poultices, &c. have been injurious, seems to have been because they retarded the requisite escape of it.

THAT poultices are very bad conductors of heat has before been remarked, but this does not seem to be the case with oil, indeed when of a temperature much lower than that of the part to which it is applied, it is a tolerable good conductor of heat, and therefore, for a while, must cool the part, as is found by experience; but when it has acquired the same temperature, it loses this power, as it cannot, like water under the  
same

same circumstances, continue it by evaporation; as this does not take place, with this fluid, at any temperature which can be acquired by the human body, and consequently, from that time, it must serve to retain the heat upon the surface. It is, moreover, when exposed, for some time, even to a moderate degree of warmth, disposed to acquire rancidity; and, in that state, it must, evidently, tend, by its acrimony, to excite heat in the part; more especially when the texture of the skin has been previously broken by the disease.

THE nature of the disease, and the observations derived from experience, clearly, then, point out the principle on which it admits of the most relief; for though there may be concomitant symptoms which may require the use of peculiar internal medicines, yet, as far as relates to the mere external disease, I cannot but consider it as an extraordinary accumulation of heat; and that

R 2 whatever

whatever is the peculiar cause which excites it, that the injury which the skin sustains is merely on this principle. It follows, then, as in the small pox, that the time for relieving the surface most is, obviously, when the disease first appears upon the skin, by favoring the escape of the heat as soon as it arrives there; I have no doubt, therefore, but by exposure to cool air, and by frequent washing with any liquid which is a good conductor of heat, (and cold water is perhaps as good as any) that the disease would always be very much diminished, and in some cases be totally removed.

AN objection of no small weight, however, arises to the exposure to air in the more advanced stages of this disease, when the texture of the skin is broken and digestion takes place; for the access of air to a part under these circumstances must quicken its decomposition, upon the principles of chemistry, and consequently tend to increase the ulceration; and accordingly, since this sub-  
ject

ject engaged my attention, I have observed, that though patients complain immediately of an increased sense of burning, when the part is covered by any rare substance, as flannel, lint, &c. yet they do not fail to experience a sense of smart not less intolerable, if the part be totally exposed to the air; and which cannot, in the latter case, be owing to the coldness of the air, as a piece of linen moistened with cold water immediately alleviates both sensations.

THE effect of air upon wounds has not, I think, been sufficiently attended to in the practice of surgery, and yet I am convinced it is of the utmost consequence; as I have no doubt but the healing of wounds would be much accelerated by exposing them less frequently to its influence, than is commonly done.

For this reason, therefore, I would recommend, as the best topical application in  
the

the erysipelas, to cover the part with linen rags moistened with water, and to add a fresh supply of moisture as they become dry, without taking them off; by which means the heat which arrives at the surface will find a ready escape, and the part will, at the same time, be protected from the injurious contact of the surrounding air.

SECTION



## SECTION VIII.

*The Elephantiasis.*

ONE of the reasons which induced me, when I first began to consider this subject, to believe that cutaneous diseases were produced by an accumulation of heat, was, that these diseases are most frequent and most virulent in warm countries; and the elephantiasis, may, I think, be instanced as a striking proof of this.

GRIEVOUS as this disease is in our own temperate climate, it is well known, from the accounts of travellers, and the most authentic medical histories, that it is beyond description intolerable in hot countries.

THE

THE practice which has been found most useful in the treatment of this disease, and which attains to a much greater extent in warm countries than with us, is frequent bathing; and I think this may be accounted for on the principle of its carrying off heat from the surface; and if so, it is a further proof of the nature of this complaint, and should, therefore, I think, lead to a more frequent use of the bath than is at present practised with us, and even to keep those parts of the body which are more particularly diseased, constantly wet by the application of linen rags moistened with water.

It may not be improper, in this place, to remark, the universal custom of frequent bathing in warm climates; the inhabitants of these countries being prompted to it not only by personal inclination, the force of acquired habit and general example, but, in some places, even by the most positive ordinances of religion.

THE

THE Levitical law of the Jews seems particularly calculated to guard against the ill effects of uncleanness; by which general name, among many other distempers to which the human body is subject, the various kinds of cutaneous eruptions are particularly distinguished; and for the prevention and cure of which, repeated washings and bathings are enjoined by the Priests.

THAT these means have been found salutary in such complaints, may be presumed from the universality and long continuance of these practices in those countries where such diseases are most frequent; and therefore, whether it be admitted that these effects are produced by a superabundant heat being carried off by these means, or not, (though the preceding theory renders this very probable,) the fact itself is surely sufficient to recommend the use of the same means in all similar affections.

## SECTION IX.

*The Tinea Capitis.*

**H**OWEVER absurd many of the popular names of diseases may be, yet where they express either the sensation of the patient, or any peculiarity in the appearance of them, they, perhaps, deserve some attention, and may, possibly, in some instances, serve to explain the nature of them.—The name by which the tinea capitis is known among the lower orders of people, at least in this part of the kingdom, is the\* *scald head*; from

\* THIS word, as commonly pronounced, has the meaning which I have here given it, and I have no doubt  
but

from which, I think, we may fairly infer, either that the patient experiences a sense of extraordinary heat on the part, or that the pustules and ulcerations which constitute the disease, resemble those which are produced on the skin by external burning.

THAT a degree of heat, not much exceeding that which is natural, should soon produce inconvenience on the head, is not to be wondered at, when it is considered that this part has a natural covering which is badly calculated to carry off superabundances of heat: and on this principle, namely, the removal of what retards the escape of heat, I should imagine it is, that where the disease is not of long standing, a cure is often obtained merely by cutting off the hair.

but such is the vulgar acceptance of it; but it may, perhaps, in strict propriety of language, be considered as the adjective of the old English word scall, a scale or scab, particularly as applied to a leprous eruption. In this sense it is used in scripture.—See Leviticus, Chap. xiii.



IT is well known, that this complaint is most frequent among the children of poor people, and particularly among those who are uncleanly. That children should be the most subject to it, is probable, from a circumstance that I have repeatedly had occasion to remark before, namely, that their natural heat much exceeds that of grown up persons; and that a want of cleanliness respecting the heads of children should be productive of this complaint, by lessening the natural escape of heat from it, is very probable, from those children being so little liable to it whose heads are regularly combed, and frequently washed; as these most obviously tend to promote its escape. Even the mere temporary separation of the hair by combing, and the removal of dirt and powder which may have been collected amongst it, is well known, by grown up persons, to render the head cool and comfortable, and that a neglect of it occasions heat and disagreeable itching; and when long continued, and the heat is still more

more retained upon the part by artificial additions of hair, and by the accumulation of powder and pomatum, cutaneous eruptions, not much unlike the tinea itself, are not unfrequently produced. The late preposterous mode of covering the female head with enormous cushions of wool and hair, and of dressing the hair with such an excessive quantity of powder and pomatum, unless frequently taken off, and the hair well combed, must, I am persuaded, on the principle of its favoring the accumulation of heat, have, in many cases, produced such a complaint; and more than one or two instances of such have actually come under my notice.

THE difficulty of curing this disease, when neglected in its early stage, and when it has spread over a considerable part of the head, must be well known to all practitioners who have had many opportunities of seeing it: this has given rise to many different methods of treating it, and to an endless variety of applications,

applications, all which, in their turns, have proved inefficacious; and as some of them are attended with circumstances little short of cruelty, it would be a most important improvement in the medical art, to be able to cure them with more certainty, and with less painful methods.

THE experience I have had in treating this disease according to the method which is obviously suggested, by considering it as owing to an extraordinary degree of heat being retained on the part, is, as yet, confined to two cases; and however improper it would be to draw a general opinion from them, yet, as far as they go, they are striking proofs of the good effects of keeping the part constantly under circumstances which favor the escape of heat; and by persevering in which, the cures appear to have been obtained.

CASE

## CLASS E. I.

IN the summer of 1784, a young lady, about eight years of age, in all other respects in good health, had been for some time past subject to slight eruptions on the head, and at the back of the neck, in that part which is covered with hair: about the close of the summer it increased very much, and in a little time a thick greasy crust, three or four inches in diameter, was formed on the crown of the head; the appearance of it was particularly foul, and the smell offensive, as a foetid discharge was constantly oozing from the inside of the scab, which being soon inspissated, added constantly to its thickness and extent: round the edges of the principal crust were many smaller ones; and which were spreading and enlarging like the other.

THE hair was immediately removed for some distance round the part affected; a mercurial unguent was made use of, and several  
doses

doses of an alterative purging medicine were given internally; but the disease evidently gained ground.

THE subject of heat, at this time, particularly engaging my attention, it occurred to me, that this complaint might, possibly, be in some measure produced by an accumulation of it; at least, whatever was the cause of it, it appeared very probable that the large and increasing scab which covered the diseased surface, retarded the cure, on the principle of its preventing the natural escape of heat, it being, evidently, of such a loose texture, as to be a very slow conductor of it. I resolved, therefore, immediately to try whether keeping the part constantly moist with wet rags would not relieve it, by favoring the escape of heat from it; but as whilst the thick crust was interposed between the surface of the head and the wet rag, its influence could but be felt in a very small degree; I previously removed the scab, by an ointment



ointment slightly impregnated with a decoction of cantharides, it being composed of the Unguentum Epispasticum of the Edinburgh dispensatory, and two parts of axungia; and the surface being now perfectly exposed, and in a state of digestion, I immediately applied a piece of linen cloth, soaked in water, not quite so cold as the air was: the disagreeable smell was immediately removed by this, and the child appeared more comfortable. I recommended the rags to be constantly wetted as they became dry, but to be removed very seldom, that the air might not be brought too often in contact with it. For a while the part looked much better, and seemed disposed to heal, but it not being kept so constantly wet as I could have wished, from an apprehension that the plan was attended with some danger of giving the child cold, the scabs again formed, and I was a second time under the necessity of removing them by means of the stimulat-

T

ing

ing ointment; after which I prevailed upon the mother to consent to its being more frequently wetted, and which being accordingly done, the good effects of it became manifest in a few days, as the discharge of matter was totally suppressed; and though there was something like a crust formed by the thickening of that which exuded the first two or three days after the ointment was used, yet it was perfectly dry, and scaled off by degrees, though slowly, leaving the surface of the head, in the course of some weeks, perfectly cicatrized; after which I still thought it right to continue the wet rags; and when the skin appeared to be whole, I even made the water, in which the linen was moistened, more volatile, by the addition of a little rectified spirit of wine.

C A S E

## CASE II.

IN November 1784, I was desired to see a young gentleman, about six years of age, who, though in other respects remarkably healthy, had an eruption of this kind on the head. It began in October, and was at this time very similar to that in the last recited case, but more extensive, as it nearly covered the whole head.

THE hair was immediately removed, and the same mild epispastic ointment, as used in the last case, was applied; and when the scabs were removed, the whole surface was kept constantly moist with a weak saturnine water, (simple water not being used, because I had reason to believe that an application so unusual, and in appearance so unlike a medicine, would not have been used to the degree I was desirous of).

THE relief obtained by this method was even more striking than in the last case, and the cure was perfected in a shorter time; though I cannot help thinking that the season of the year, it becoming very cold at this time, had some share in effecting it.

It has, I know, long been the practice in obstinate cases of this kind to produce a considerable digestion on the part by the application of acrid and stimulating ointments, and I am aware, therefore, that the medical reader may say that these cures were possibly effected upon that principle: there is, however, I am persuaded, a very material difference between that method and the above; for in those cases in which it has been thought right to irritate the surface, the applications for that purpose have been usually continued for some time, and a state of digestion and discharge kept up all the while; whereas the use of it in these cases was obviously merely to remove the scabs,  
that

that the wet rag might come into more immediate contact with the part affected, and which, could it have been effected with as little trouble and as little pain to the patient by mechanical means, would, I am satisfied, have answered the purpose equally as well; and so far from the cure having been promoted by the discharge having been kept up, it appears very probable that it was obtained by the suppression of it, the wet rags carrying off that degree of heat, which, perhaps, was the sole cause of a fresh accumulation of it.

It is not, however, to be supposed that the wet rags are to be continued until the discharge is completely stopped, but that they are to be continued until the discharge is so much diminished as to be no longer attended with the usual symptoms, as not to be the subject of medical attention.

## SECTION

Physicians have, indeed, attempted to cure the disease by the use of various remedies, but without success.



## SECTION X,

*Febrile Rashes.*

**F**EBRILE rashes, (in which, however, I mean not to include those eruptions and efflorescences which take place in the advanced stage of some acute fevers, and which, I think, may be considered as nearly allied to the miliary eruption, and as, being probably produced by the same causes, requiring a similar mode of treatment,) are usually of so short a date, and attended with such mild symptoms, as not often to be the subject of medical attention.

NOSOLOGISTS have, indeed, attempted to divide them into different species, but  
this

this can scarce, upon any occasion, answer a useful purpose; and for the slight notice which I shall take of them, and which is more to exemplify the preceding general theory of heat, than to recommend any new mode of treating them, must be absolutely unnecessary.

I CANNOT help considering them all as produced by similar causes, which excite in the habit a temporary increase of animal heat, and which, tending to the surface, and not immediately effecting its escape, produces the red spots termed rashes: it is obvious, therefore, that, I suppose, they bear some analogy to the more important eruptions of the small pox and the measles; and this I am the more readily led to believe, because these rashes are frequently epidemic, if not absolutely contagious.

IF they be produced by any kind of virus, it is evident, from the slight indisposition which precedes the eruption, that the habit suffers very little from its introduction; and probably the degree of heat excited is for that reason proportionably small: I believe, however, there is another reason which operates in rendering the eruption generally so mild. Patients in this disease, from not being previously indisposed, seldom suffer the disadvantage of having been confined within doors, and kept warmer than usual for a day or two before the eruption makes its appearance; which, in the natural small pox and the measles, certainly must often favor the accumulation of heat; and are therefore, perhaps, at the time of its appearance, in a situation very favorable to its passing off.

IT is well known, that these eruptions will frequently totally disappear by exposure

sure to cold, which seems to agree with the foregoing conjecture, and in my opinion, to prove, in a striking manner, that they are produced by a heated surface. This circumstance has, however, been usually considered as attended with danger; and perhaps, as the only hazardous symptom belonging to the complaint, an idea having been conceived that the disease is by this means repelled, and that the morbid matter, which was before disposed to have made its escape by the skin, is thus returned into the system.

THIS notion of the repulsion of morbid matter, in cutaneous diseases, I am persuaded, is totally founded in error, and has been productive of much mismanagement; and, I fear, is still an obstacle to the use of those means which the nature of them, if generally considered as the effects of an accumulation of heat, so obviously indicates.

I HAVE never yet heard of any real bad consequences which have followed the sudden disappearance of these eruptions, much less have I ever seen any, and I cannot help thinking, therefore, that they have existed only in the apprehensions of the patients and their attendants; and as experience has so fully proved, that even in the small pox, where the disease is so much more virulent, that the greatest diminution of the eruption, by exposure to cold, may take place without any possible injury, it may surely be inferred, that nothing is driven back into the system, but that the disease is, by this means, actually carried off and dissipated.

DURING the eruptive stage of the inoculated small pox, I have sometimes found my patients much alarmed at the appearance of an universal efflorescence on the skin, and which, if the surface of the skin were not at the same time perfectly smooth and totally free from prominencies, might easily be mistaken



mistaken for a true variolous eruption. If the patients be kept cool, this seldom lasts longer than twelve, eighteen, or twenty-four hours, and if exposed to a considerable degree of cold, it will usually disappear much sooner,

IN the very severe weather of last December I inoculated several healthy children at the same time: they lived in the country, and had been accustomed to be much in the open air. On the second day of the eruptive fever, when several pustules had appeared in all of them, one child was suddenly seized with this kind of rash, and the parents, much alarmed at the circumstance, sent for me. I found the child near a large fire, and covered with an unusual quantity of cloaths; its face, arms and body were as universally covered, and with an efflorescence of as deep a color as I had ever seen. The ground was covered with snow, and the thermometer was at 24 deg.; but, notwithstanding this, I directed some of the cloaths

to be immediately taken off, and the child was at once brought into the open air, in which it remained several minutes: the skin was very soon of a much paler complexion, and by continuing to keep the patient much cooler than it had before been, the whole disappeared soon after I left it, there remaining but ten pustules of the small pox, and the child having no other complaint afterwards.

THE object of the medical treatment of these rashes appears, therefore, as in the other diseases before enumerated, to be the favoring the escape of heat from the surface; and though the complaint is usually so mild that it will be seldom necessary to expose patients to a great degree of cold for that purpose, yet I have no doubt but that the contrary extreme, of keeping them very warm, will tend to increase the degree and duration of it, and that if any circumstance ever makes this eruption deserve the name of a disease, it is this improper method of treating it.

#### SECTION

## SECTION XI.

*The Anthrax.*

**A**NTHRAX, or Carbuncle, in the most literal sense of the word, expresses either the state or effect of burning, and is, therefore, particularly adapted to the peculiar fiery tumor which constitutes this disease.

IT has been considered by medical writers as of two distinct kinds, the malignant and non-malignant, the inflammatory and the putrid; but though perhaps each of them may, in some instances, partake of both these kinds, there being, usually, in the earliest stage of the malignant, symptoms of true inflammation, and in the latter stages of the

the

the inflammatory, where it has been of long continuance, and the inflammation been very considerable, there often coming on a malignant appearance of the part affected, and the patient's general symptoms requiring such medicines as are exhibited in putrid diseases, yet that state of it, which most obviously bears a relation to the foregoing system of heat, must undoubtedly be the inflammatory; and it is this state of it which I shall at present alone take notice of.

WITHOUT adverting, therefore, to the peculiar cause in the habit, which may excite so great and so local an accumulation of heat, and which it would be, perhaps, very difficult, if not impossible, to investigate, the fact, namely, that the anthrax is immediately produced by an extraordinary accumulation of heat, appears evident from the peculiar sense of burning in the part which the patient always complains of; from the highly inflamed appearance of the tumor; from the actual heat which may be felt on it when

when the hand is applied to it; and from the integuments and cellular substance being destroyed in a manner so much resembling the effects of burning from external fire.

IT is, perhaps, worth remarking, that fat people are most subject to the true inflammatory carbuncle, and that it usually makes its appearance on those parts of the body where the adipose substance is most abundant, as on the lower part of the back, on the podex, and on the under surface of the thighs; and the reader may remember, that I considered that substance as the part in which the greatest quantity of concealed heat probably resides; these parts, especially in persons who are much sedentary, being also usually so circumstanced as not to favor the escape of heat.

THE waste of the cellular substance, much beyond the limits of the tumor, which is so often experienced in this disease, is likewise, perhaps, another effect of the neighbouring



bouring heat; for the fat seems to be really melted down by it, and discharged in a fluid state, even when what is termed a suppuration has not taken place.

THAT this tumor is owing to a real accumulation of heat, is further highly probable, from a swelling very much resembling it being sometimes produced by an external cause, which evidently excites an extraordinary quantity of heat; namely, long continued riding on horseback in warm weather. It has before been observed, that heat, in this instance, is generated by attrition, and that it accumulates in consequence of the part on which it is excited being in a situation which does not admit of an adequate escape of it.

IN considering the treatment of this complaint, I think there can be little doubt, from the foregoing view of the nature of it, but it ought to be principally directed to the diminution of heat on the part, by the topical application

application of such substances as are good conductors of it, and by the internal use of such medicines as tend to lessen the generation of it within. Enough has been already said on the comparative heat-conducting powers of poultices, and watery lotions, to convince us that the latter must have a preference as a topic in all cases where the quick escape of heat is requisite; and I make no hesitation, therefore, in the strongest terms to recommend their use in the present complaint, in the manner which has been before mentioned, namely, by wet linen cloth constantly kept upon the part; and I have no doubt, but if applied very early in the disease, and persevered in for some time, that the pain will be much mitigated, the heat diminished, and the general danger of the case be much lessened by it. The cooling effects of evacuations, and particularly by purging, whether produced, as I have before conjectured, on the principle of their removing what would furnish more matter of heat or not, are sufficiently known, by

X

experience,

experience, to render their use obviously proper in all cases of considerable inflammation, and there can be no doubt therefore of the propriety of them in such cases as these.

I AM the more earnest in urging the use of this plan, even to a considerable extent, at the beginning of this complaint, because I am persuaded an idea of the strong tendency there is in the anthrax to assume a malignant disposition, has too much deterred practitioners from that use of the cooling regimen, in the first and truly inflammatory stage of it, which is otherwise so obviously indicated; and which, so far from doing any injury, can perhaps alone prevent those very symptoms of malignancy which, it must be acknowledged, so often come on in the more advanced state of the disease, but which are evidently, at least as far as relates to the local disease, in a great measure produced by the high degree of inflammation which has previously occurred; and particularly because I have lately experienced the most happy effects of such a  
mode

mode of treatment in a case of this kind, where the appearance of the tumor was at first very threatening, and where the gross and plethoric habit of the patient rendered him a very unfit subject for such a disease.

## C A S E.

THE subject of this case was a gentleman about forty years of age; he was corpulent, and, as before observed, of a full habit, but he was by no means an unhealthy man, nor had he ever been intemperate.

HAVING, for some weeks before, been teased with many small pustulary eruptions on the podex and the thick part of the thigh, and which had been attributed to riding on horseback, the weather having been very hot, a swelling, which was truly carbuncular, fixed on the lower part of the glutæus muscle. The tumor itself was but small, but it had the true characteristic

purple colour, and the most prominent part of it terminated in a pimple, or pustule, which soon broke, and discharged a small quantity of a thin bloody ichor. The inflammation which surrounded it, and which formed, as it were, the base of the tumor, extended, however, more than half way down the thigh, and covered a considerable portion of that side of the podex, and the teguments, almost as far as the limits of the inflammation, were extremely hard, and to the touch felt unusually hot. With such a degree of inflammation, and situated in such a part, it may easily be supposed the patient felt intolerable pain, but the sensation of which he most complained, was that of excessive heat.

WHEN I first saw him, the tumor had been formed two or three days; the inflammation, however, had been trifling until the preceding day, but had increased rapidly during the night: He had, notwithstanding this,



this, very little fever, his pulse were but in a small degree quickened, and he was evidently no otherwise indisposed than from being in great pain, and from having had a night without sleep.

THOUGH the complaint obviously appeared to be local, I thought it right to bleed him largely, to give him a purge immediately, and to direct him to eat very sparingly; and as I found him sitting in a very awkward posture, I desired him to go to bed, to lie in the easiest posture he could find, and with but few cloaths upon him; and I further directed that the part should be constantly kept well moistened with the aqua saturnina.

WHEN I saw him in the evening, I found the medicine had purged him considerably, and that he evidently felt the part cooled by the lotion; but the appearance of it was but little altered. I found, however, the next morning,

morning, that the pain had so much abated, that he got some refreshing sleep in the night, and the part was evidently less inflamed: I still thought it right to bleed him again, and directed another purge to be taken the following morning, and that the part should be still kept moistened with the lotion. I was surprised to find him so very much better the next day: the inflammation was now diminishing every hour, and before the end of the week there was scarce a vestige of it; there was, however, a separation in the tumor itself, and a small ragged slough came away, leaving a wound which healed without any difficulty.

I HAVE never, in my practice, seen an inflammation which was at first so very formidable in its appearance, and which threatened so large a destruction of the teguments and cellular substance, subside so rapidly; and I think there can be no doubt but this happy termination was produced by the prompt

prompt and powerful means which were used to lessen the general heat, and that the watery lotion, externally applied, had no small share in effecting it, by diminishing the accumulation of heat in the part itself,

SECTION

## SECTION XII.

*The Phlegmon.*

THE phlegmon, or boil, being an inflammatory swelling so exactly resembling the first and inflammatory stage of the anthrax, as just described, it cannot be necessary to consider it separately, the same general method of treatment recommended in the latter, especially in what relates to topical application, being so immediately applicable to the former.

THOUGH not perhaps strictly connected with the subject of this section, as expressed in its title, I am yet led, from the experience of a recent case, to observe that this  
mode

môde of treatment is beneficial, even when applied to suppurating tumors; it evidently tending greatly to diminish the general pain of suppuration, and lessening the quantity of matter generated by it.

MEDICAL practitioners seem to be strongly possessed with an idea that suppurations are usually efforts of nature to throw off something morbid from the habit, seeming, as one would imagine, to suppose that the matter deposited in abscesses contains the diseased principle, and which, therefore, must be evacuated externally. Hence it has been conceived that there is always hazard in endeavouring to discuss tumors which threaten suppuration; and hence the universal custom of the early use of cataplasms in such cases, which are well known to promote it.

I AM by no means satisfied that this idea is just, even as a general consideration; and that there are particular tumors which it is



not only proper, but perfectly safe, to discuss, I think must be admitted by every surgeon who has seen much practice.

THE swellings which sometimes form under the arch of the lower jaw, and on the side of the neck of young people, and which are usually enlarged glands, are evidently of this kind; for, independent of the peculiar cause which may excite them, their situation, the injury which the neighbouring parts suffer if they suppurate, and the scars which are usually left, if too large openings be made into them, or if the air have too frequent access to the wounds, render it so very desirable a circumstance to prevent their suppuration, (more especially as it is well known that the smallest marks of a cicatrix in such parts give a suspicion of a scrophulous taint in the constitution), that, admitting there were a possibility by it of throwing back into the blood something which would be noxious to the system, I will venture to say, that  
there

there are few persons who would not prefer the discussion to the suppuration of them,

WHATEVER may be the cause which occasions the obstruction and enlargement of these glands, it is evident that the principal symptom is the production of an unusual degree of heat; and that an extraordinary degree of heat should occasion the destruction of such soft, cellular and glandular substances, and produce such a solution of their parts as seems to take place in suppuration, may certainly very easily be conceived. I cannot help, therefore, thinking, if it be in our power to prevent such an extraordinary degree of heat accumulating, that much of the mischief of such cases may be obviated.

### C A S E,

IN January 1785 I was consulted for a little boy, about five years of age, who had a very large and hard tumor under the jaw,

Y 2 It

It had been of several weeks standing, and at this time put on the appearance of an approaching suppuration ; and which, from the pain complained of, and extent of the swelling, threatened to be very considerable.

THE part had been hitherto kept very warm, and the most obvious application which the common practice of surgery suggested, was an emollient cataplasm ; and which, as I considered the suppuration as inevitable, I immediately recommended. Adverting, however, to the subject of heat, which had lately much occupied my mind, I was not without apprehension that the pain and inflammation would be unnecessarily increased by it, I resolved, should it prove so, to discontinue its application.

THESE symptoms were, as I feared, much aggravated by the poultice being upon the part even for a few hours ; the child became much more uneasy than it had

had before been, and the whole tumor was more inflamed and tender. These, however, being effects usually expected under such circumstances, and the suppuration being evidently, by such means, promoted, there are few surgeons who would have considered them otherwise than as proper; but as the tumor was unusually large, and threatened an excessive suppuration; as the latter seemed likely to be increased by retaining the heat on the part; and as I had already had several striking instances, though in cases not exactly similar to this, of pain and inflammation being much diminished by encouraging the escape of heat from the part affected, I discontinued the poultice, directed the whole swelling to be frequently wetted, and to be kept constantly exposed.

THE pain, inflammation and redness of the tumor, and more especially of its edges, on which they were before spreading, were evidently alleviated by this treatment; and  
though

though in a few days I could distinguish a fluctuation, and the teguments in that part of the swelling, where the fluctuation was most perceptible, became every day thinner, yet the child complained of but little pain, except when the part was touched.

IT was my intention, when the skin was very thin, to have made a small puncture into the most prominent and dependent part of the tumor, but nature performed this office full as well, for in about a fortnight after my first seeing it, it broke in a part very advantageous for the discharge; and though the opening was small, a considerable quantity of a foul sanious matter came away. I now directed the whole to be covered with a moist rag, and the wound to be carefully guarded from the air,

A DISCHARGE of the same kind continued for a few days, after which the wound healed up so perfectly, and with so smooth a surface, that not the least scar remained; the  
hardness



hardness and inflammation of the adjoining parts went, likewise, away, so entirely, that at the time of writing this, which is not three weeks since the tumor broke, there is no other vestige of what had so lately been so formidable a swelling, but a slight discoloration of the skin, and which is every day becoming less.

HAD this been treated in the usual way, with thick and warm poultices, I am persuaded that the patient would have had much more pain whilst the matter was forming, and that the suppuration would have been much more extensive: Had the abscess, moreover, been opened largely, with a view to the discharging all the matter at once, and to the preventing any cavity remaining; had lint been pressed into the wound to prevent its union before it was imagined the matter had been sufficiently discharged; or had warm applications been used, or even common poultices continued, with the design of promoting a complete digestion,

digestion, all which have been recommended by many practitioners, (but all which, as serving to stimulate parts in so very sensible a state, must evidently have excited fresh heat and inflammation in them,) I have no doubt but the cure would have been protracted to a very tedious length, the injury sustained by the part have been very considerable, and the cicatrix probably large and irregular.

THE practical inference which, I think, may fairly be deduced from the event of this case, is, that poultices, and such coverings as prevent the escape of heat, are not only less necessary to the suppuration of tumors than is commonly supposed, but by increasing the heat in parts in which usually too great a degree of inflammation already exists, that they aggravate the pain of suppuration, and increase its ill effects; and on the other hand, admitting the propriety of ever endeavouring totally to prevent, or in any degree to lessen a suppuration, that these purposes

purposes are most likely to be obtained by freely promoting the escape of heat from the parts affected.

THERE is, however, one quality in poultices which must be acknowledged to be well adapted to cases of this kind, and which, probably, alone occasioned their introduction into the practice of surgery; I mean their softness and greasiness, which, obviously, must tend to relax the surface of the skin, and dispose it to give way more easily when it begins to be stretched by the fluid under it: but even this purpose might, probably, be equally as well effected by the skin being kept constantly moist with watery lotions, or at least by being occasionally lubricated with oil.

## Z      SECTION

## SECTION XIII.

*Burns and Scalds.*

I NEED not observe that burns and scalds are the effects of external heat, and though, in common language, the one means the effects of the application of a boiling fluid, and the other of a burning body in a more solid form, yet in both cases the injury sustained is evidently in consequence of the part receiving an extraordinary quantity of heat.

WELL knowing how universally the common idea of fire remaining for some time in a part which has been burnt, is exploded, it may, perhaps, seem strange that I should suppose any of the effects of burning, and  
 - more





As heat is constantly generating in the animal body, and constantly tending to pass off by the surface, it is obvious, that if the surface be heated to an extraordinary degree by external fire, that it will be unable to carry off that which arrives at the surface from within so readily, as it does in the natural state of the skin; and that, therefore, under these circumstances, unless some means be used, which render the skin able to carry off a more than usual quantity of heat, that it must evidently accumulate there, and produce all the inconveniences of such an overcharge.

It has been said, that the supposition of heat remaining in any part of the human body which has been burnt, is shewn to be absurd, by its being evident to our senses that none remains in a stick that is half burnt, and that is removed from the fire which made it burn originally; but surely the circumstance which I have just mentioned of the constant generation of heat within

within the animal, must, at once, render the comparison between a living animal and a piece of wood inadmissible; as in the latter there can be no such internal production of heat, and there can be nothing, therefore, to prevent the immediate dissipation of that heat which is left after the actual burning has ceased.

BUT, independent of the foregoing conjecture, it may be presumed that an extraordinary quantity of heat remains in a burnt part, from the obvious sense of heat which is experienced after the burning substance which first communicated the heat is removed, and from its being felt immediately, and consequently long before it could have been excited on the common principle of inflammation, in a part which has received an injury, and which is known to be more remote; and from the relief which the part affected feels, when put into a situation which favors the escape of heat from it.

MOST of the popular remedies for burns have plainly been adopted on the principle of cooling the part; and many of them are well known, in a very surprising manner, to lessen the pain which immediately follows the accident, and to prevent the usual consequences of burning, such as blistering, ulceration, &c. Scraped potatoes, and many other similar vegetable substances, bruised and made use of whilst cold and moist, are very common applications for this purpose among poor people; and it is well known, that some artificers, whose employments expose them to frequent accidents of this kind, find the quickest relief from moistening the part immediately with spirit of wine, the volatility of which makes it very soon evaporate, and consequently enables it to carry off a considerable quantity of heat from the part.

THE saturnine water has been found so useful in recent burns, that I believe it is now pretty generally applied in such cases; and

and the reader may, probably, have heard that it was the principal remedy made use of in the hospital at Chester, a few years ago, when so many persons were burnt at the same time by an unfortunate explosion of gunpowder, and that its effects in alleviating the pain in the first instance, and in expediting the cure, were very striking.

THESE, and similar facts, which must be well known to most people, of themselves sufficiently shew the principle on which these various applications afford relief, and furnish, I think, more than a presumptive proof that an extraordinary degree of heat exists in parts which have been burned.

I HAVE lately had a very singular instance of the good effects of treating a recent burn upon the plan of carrying off heat from the part.

C A S E.

## C A S E.

A YOUNG gentleman playing with gunpowder, which he held in his hand, it took fire, and his hand being near his face, both parts suffered considerably from the explosion. The cuticle was raised on nearly one half of the face, the inside of the hand and fingers were much blistered, and several small eschars were formed on both parts. I immediately discharged the ichor which was gathered in the blisters by small punctures, so that the surface underneath was not exposed to the air, and the whole was well soaked in a weak and cold saturnine solution; linen cloths wetted with the same were applied to the parts, and moistened on the outside as they became dry: the pain and heat which at first were considerable, so large a surface having suffered, soon abated, and the same method being pursued, I was astonished to find that not only the blisters, but even the eschars were entirely healed within five days



days from the accident; and which, as a very small degree of digestion took place, may be almost considered as effected by the first intention.

I AM fully persuaded that this rapid cure was produced by the applications I used having so much favored the escape of heat from the part; for I think I have before observed that I consider the use of the saturnine lotion, in such cases as these, merely as so much water, it being on this principle alone that I used it in this instance; and at the same time I have no doubt, though the patient was in perfect health, and had a sound constitution, that if the parts had been dressed with plasters spread thick with ointment, especially if it had been of the digestive kind, and had been kept very warm by much external covering, that the digestion would have been very considerable, and the cure, probably, protracted to some weeks.

A a

FROM

FROM what has been said, I think myself fully authorized strongly to recommend a similar mode of treatment in all recent cases of burns ; and as oils, ointments and other unctuous applications, which have been heretofore so much used in these cases, are evidently slow conductors of heat, I think the practice of surgery would be benefited by laying these aside in such cases, or at least by confining their use alone to such in which a considerable digestion must unavoidably take place.

## SECTION

## SECTION XIV.

*Spreading Ulcers, attended with an extraordinary Sense of Heat.*

THOSE who have been much conversant with the practice of surgery, must sometimes have met with a peculiar kind of superficial ulcer, which is extremely sensible, is described by the patient as singularly hot, and, being much disposed to spread, is very difficult to heal.

MEDICAL writers and practitioners have usually considered such ulcers as arising from some morbid disposition in the system, and from having experienced the little advantage which is derived from the various

topical applications, have agreed that the treatment of them should be principally directed to the correcting the disease in the habit by alteratives, diet, &c. but necessary as this may be, I am persuaded that one symptom, and which has been scarce at all attended to, may be greatly relieved by an external application; and by the removal of which the disposition to spread will be lessened, and the healing promoted. This symptom is the extraordinary degree of heat which is felt in the part, and which, however difficult it may be to account for its presence in such ulcers, certainly contributes in no small degree to the extreme sensibility of the part, and to the increase of the ulceration.

THE nature of the disease, and the topical application, which seems to be indicated by the before mentioned symptom, will, however, be best understood by the following narrative of a very extraordinary case of this kind, which lately occurred to me.

C A S E.

C A S E.

— P —, a woman between 50 and 60 years of age, of a tender and rather unhealthy constitution, in the spring of the year 1783 had reason to believe she had received the venereal infection; she had the common symptoms of a gonorrhæa, attended, however, with rather more than usual virulence.

BUT little time was lost before means were used for the removal of it, which, in the course of a few weeks, seemed to be efficacious, as the symptoms gradually subsided; and in about six weeks she thought herself perfectly well.

ABOUT three weeks from this time, there appeared, however, a small pimple upon the upper part of the thigh, and exactly upon that part of it which touches the skin of the lower



lower part of the abdomen, unless the whole figure be extended, and consequently is in close contact with it when sitting, or when the legs are drawn upwards. The pimple was much inflamed, and exquisitely tender, and very soon broke; it discharged a small quantity of thin offensive matter, and the small ulcer which remained had a very foul appearance, and in a very few days became more extended.

UNDER the circumstances of my patient, I could not but suspect that this was produced by the venereal virus, and that it was more in the habit than the former symptoms led me to imagine; I had recourse, therefore, immediately to mercurial frictions in the usual mode, and the wound was likewise dressed with the unguentum cœruleum fortius.

THAT the mercury was sufficiently absorbed, and entered into the circulation, was evident, from a slight ptyalism being soon induced by the use of it; but, notwithstanding  
this,

this, the ulcer continued very foul, and spread considerably; it became, likewise, more tender, felt remarkably hot, and, from the very awkward situation of it, every change of posture was attended with great pain.

I THOUGHT it right, however, to persevere in the use of the mercurial ointment, regulating the quantity used so as to prevent an excessive spitting, and I now joined to it the decoction of the woods, of which she took liberally every day, her diet being at the same time of the mildest and least stimulating kind, and consisting principally of broths and milk; the utmost attention was also paid to keep the part clean, and which, though I did not dress it myself, I was fully convinced of from the patient herself and her attendant being singularly neat and cleanly.

THIS plan was pursued more than four months, in which time many ounces of the ointment were rubbed in, but the ulcer still continued to spread, and the tenderness of the  
part

part to the touch and sense of heat in it were much increased; but no other symptoms whatever of a venereal affection were present during the whole time.

THE mercury, in the form in which it had been so long administered, appearing not likely to be of the least use, I tried the internal use of the corrosive sublimate, still continuing the use of the alterative decoction, and observing the same kind of diet; and as the ulcer was now of very considerable extent, and the sense of burning in it was almost intolerable, I tried a great variety of applications to the part, including the softest liniments, and the most cooling lotions, but none of them abated the sense of heat little longer than the moment of their being applied.

THE corrosive sublimate was taken about three months, and she became able to take very considerable doses of it, but without the least efficacy as to the ulcer. I then tried

one

one grain of calomel, night and morning, and as this purged her a good deal, I joined half a grain of opium to it, and which I considered but as a small dose, as, on account of the very bad nights she otherwise had, she had been in the habit of taking from twenty to thirty drops of tinctura thebaica every evening, and I believe the calomel was continued at least another month; after which, as the complaint still gained ground, I despaired of her obtaining any relief from the use of mercury. As the ulcer had made a more rapid progress than ever within the last week, and looked particularly foul, I now thought it right to give her the cortex, and to direct her food to be rather more substantial and nutritive: and this plan was pursued to a considerable extent more than two months, as she took between two and three ounces of the medicine in substance every week; but still she was so unfortunate as to find not the least advantage from it.

IT was now about a year since the complaint first began; and the ulcer extended at this time almost across the thigh, communicating with the inguen above, and being near two inches in extent downwards, so that the whole of it was little less than the size of a hand of the common dimensions; the burning heat in it was likewise become so excessive, and the least change of posture attended with such excruciating pain, that she was obliged to be kept constantly in bed, and in such a posture as to prevent the thigh from touching the body as much as possible. The very foul appearance of the wound, the thin and offensive discharge which came from it, and the unfavourable alteration which had evidently taken place in her health within the last month, seemed to confirm an idea which I had some time before formed of the nature of the disease, namely, that it was cancerous. Expecting, therefore, no specific relief, if I may use such an expression, I confined her to the sole use of anodynes, and  
to



to such applications to the part as seemed to keep it cleanest, and to increase the pain the least: for it must be observed, that at this time almost every application excited pain; the ceratum album, and even the softest and mildest liniments made it uneasy, and dry lint was almost intolerable to her; they all, and particularly the lint, seeming to excite an increased degree of heat.

SOME of her friends hearing that I suspected it was cancerous, and that there appeared very little probability of the disease being subdued, prevailed upon her to consult a physician.

UNDER this gentleman's care, she again took mercury in several different forms, and some new topical applications were used, among which were the tincture of myrrh, and the mel rosaceum; but still, though once or twice the wound assumed, for a while, a more favourable aspect, she was disappointed in their effects, and she again relinquished

their use. Thinking her health was best when she took the cortex, she wished to have recourse to it once more, and she therefore again took it untill she was again weary of it.

IN this wretched state, sometimes taking medicines, and for a short time thinking they did or were to do her some service, and then again despairing of the efficacy of any, she dragged on a very miserable existence for more than a year and a half; at the end of which time the ulcer was still spreading, and the general symptoms of it more aggravated.

THERE being no prospect of her obtaining a cure, the poor creature, with wonderful patience, reconciled herself to her unhappy situation, and seemed to wish for nothing more than some application which could in some degree mitigate the smart and intolerable heat which were constantly in the part.

THE subject of heat, at this time, somewhat engaging my attention, I was particularly led to consider this symptom of burning, and which had all along appeared to me rather extraordinary; and recollecting that every application which tended to retain heat in the part, particularly dry lint, which is obviously a very slow conductor of it, very much aggravated this symptom, I became convinced, that what she complained of was not a mere sensation produced by the acrimonious state of the surface, but that it was the effect of a superabundance of heat really existing in the part; and though I could give no reason for its being constantly excited there, yet, whilst its existence seemed to be certain, it appeared reasonable to attempt the removal of it by the most obvious means. The uneasiness which she likewise felt when the part was exposed to the air, and the progressive manner in which the ulcer had been increasing since the first appearance of it, proved that a gradual decomposition of the part was going on, and  
which

which chemists well know is much assisted by the free access of the external air.

THERE appeared, therefore, to be two important objects to attend to, the carrying off the heat from the part, and the preventing the surrounding air from coming in contact with it; and both these purposes seemed very obviously to be attainable by keeping a piece of wet and cold linen cloth constantly upon the part: and in order that the experiment might be made in the simplest manner, and that, if successful, the effects of it might not be attributed to any medicinal quality belonging to the application, I resolved to make use of plain water; and for the same reason, I desired that she might take no other internal medicine than her occasional anodyne; especially as she had relinquished the use of all medicines except the anodyne for some time past.

IT was not a cold season of the year, and I, therefore, thought she might use the water as  
it

it was drawn from a neighbouring well, and she immediately applied a folded piece of rag well wetted with it over the whole surface of the ulcer; the sensation was at once agreeable to her, and I gave her reason to expect that it would continue so untill it became dry and warm, when I desired it might be again moistened without being removed. This was accordingly done with great exactness; and as it really became more uneasy when it was dryer, it was kept constantly moist with a sponge, and within four and twenty hours from the first application, the heat and smart were manifestly abated: the same method was persevered in, and as I wished the wound to be opened very seldom, I did not see it till three or four days after, when I was really surprised to find that not only its aspect was much improved, but that even the edges began to heal.

THE pain and sense of heat were now so much relieved, that she had no longer occasion



sion for the anodyne; she soon, too, experienced that favourable change of her general health which was so likely to take place when she was relieved from such a constant source of irritation as an habitual state of pain may be well supposed to have been; and the progress of the cure, from the use of the same means only, was so rapid, that the ulcer was perfectly cicatrized in less than three weeks: it then was so complete both with respect to the part itself and the whole system, that there has not been even the most trifling excoriation upon the cicatrix ever since, nor any appearance of a similar nature in any other part of the body.

So great, so quick, and so happy an effect, from a cause apparently so simple and trifling, must, I doubt not, seem very extraordinary; and yet, perhaps, the history of diseases will not furnish an instance in which the effect of a medicine more immediately, and more certainly, followed its application: there can remain, therefore, no possible

possible doubt of the agency of the cold water in producing the cure, nor, I should imagine, can there be any room to suppose that it was not in consequence of its property of absorbing heat; for I can conceive no other property which water possesses, to have any influence in such a case as this, unless it be said that it might, as a mere lotion, remove the impure and acrid discharge from the surface of the wound; but this, obviously, could not be effected whilst it was suffered to remain so long upon the ulcer, as it is evident that nothing could be washed away unless the water itself, which came in immediate contact with the part, was frequently removed.

THOUGH it would be improper to draw too general a conclusion from the event of a single case, yet, as far as this goes, it certainly shews, in a very striking manner, how great a share the mere presence of an extraordinary quantity of heat has in contributing to the malignant and painful state of such

wounds as have been just described; and though the cause, whatever it be, which in the first instance excites such a superabundance of heat, may properly be considered as the primary cause of the disease, yet, it appears, from the event of this case, that the ill effects of it may be obviated, and the complaint itself subdued, merely by removing the accumulated heat.

FROM the foregoing description of this peculiar ulcer, the reader may probably be at a loss whether to consider it as originating in the venereal or cancerous virus.

I ACKNOWLEDGE that I am myself far from being satisfied in this respect. The circumstance of a recent infection made it at first highly probable that it was venereal, but the total absence of every other symptom of the same disease, its resisting every form of those medicines which are considered as specifics in that disease, and which, when the complaint is ascertained to be really venereal,  
if

if continued so long as they were in the present case, perhaps, never fail to effect a cure; the peculiar and increasing disposition in the ulcer to spread, and the very foul and morbid aspect which it assumed in the latter part of the time, gave it very much the appearance of a true cancer; and had it terminated in the destruction of the patient, as it very much threatened to do, I think there is no doubt but I should have considered it as such.

I WOULD not, however, wish to be understood that I infer from this, that the same means which were so singularly successful in this case, would be equally so in a true cancerous ulcer; yet I should certainly make no hesitation to use the same method in an ulcer that was most evidently so, if it were attended with the same symptom of extraordinary heat.

THE history of physic will not, perhaps, afford a single instance of such a cure as the

above obtained by means precisely the same; but I cannot help thinking, that among the legendary tales of early superstition, some have been related which were produced by means very much resembling them, but which, so far from having been attributed to causes so simple and natural, were supposed to have been owing to the sacred influence of a presiding Saint,

IT is well known what reputation for extraordinary cures the fainted wells and holy springs acquired in the early and middle ages of Christianity, and that there was scarce a district in which there was not at least one which had been sanctified by its vicinity to the residence of some distinguished religious character, and to which the credulous multitude continually flocked to obtain cures for their various complaints, either by drinking the water, or by bathing in the consecrated stream: and in such great estimation were some of them held, that the water became a subject of merchandize, and, conveyed



conveyed in bottles, was sold to very distant places.

IT can scarce be supposed, even in those ages of credulity, that these springs could preserve their reputation (even with all the artifices of those who were interested in their popularity) for any great length of time, unless some cures were really performed by them: some of them might, indeed, possess real medicinal virtues in consequence of mineral impregnations, and from all of them might be derived the obvious advantages of cold bathing; but as the number of those which were truly mineral ones could not be large, and as but few complaints could be relieved by the mere cold bath, it is probable that there was some other cause for some of the cures.

THE diseases for which these waters were most frequently had recourse to, were external wounds, inflamed eyes, foul ulcers, and cutaneous eruptions: and if the foregoing  
account

account of the morbid effects of accumulations of heat on the surface be in any degree probable, the reader will find no difficulty in accounting for the salutary effects of bathing in those of the eruptive kind: but it may not, perhaps, be so easy to account for those cures which were obtained at a distance from the springs, where the quantity of water must have been insufficient for any other purposes than that of drinking, or of washing diseased parts of a limited extent, under which description no external diseases can so properly come as wounds and ulcers; and yet, when used in this way, it is probable there must have been some cases in which they were found salutary, either originally to have established their reputation and the sale of them, or afterwards to have kept it up: a very few successful ones would, indeed, have been sufficient to have answered this purpose, as the monks, to whom those springs usually belonged, as appendages to monasteries, well knew how to send forth reports concerning them, in a way the most likely to engage the  
the

the attention, and excite the admiration of the public, and by the great influence which they had over the minds of all ranks of people, could not only magnify the cures really performed, but give reasons sufficiently satisfactory, in those days, as being of a religious nature, for the failure of the rest.

IF we suppose it probable, therefore, that any wounds or ulcers were ever healed by the topical application of these waters, it follows, pretty evidently, that the cures must have been effected upon the foregoing principle; and I am led to think that such really have happened, not only from the foregoing general considerations, and from the preceding history of the ulcer under my care, but am somewhat confirmed in it by the recollection of circumstances which amount almost to positive testimony.

THERE is a well in a village in the neighbourhood of Norwich, which being dedicated to a Saint in times of Romish superstition,

stitution, very soon acquired a reputation for curing diseases, and for many years was resorted to by all the good Catholics in the neighbourhood. It happened, from some extraordinary chance, that its medical reputation was revived so lately as about twenty years ago, and it was again, for a while, resorted to by multitudes of the lower ranks of people.

I RESIDED at that time in Norwich, and though, from being but a very young apprentice to a surgeon, it cannot be supposed that I knew much of medicine, it was likely that my connection with the profession should at least lead me to pay some attention to a subject which furnished such general matter for conversation; and the gentleman, under whom I was, having the care of a great number of poor, I had daily opportunities of hearing from them the many and various wonders performed by this water; many idle stories of pretended cures were talked of, which, though they for a while

while gained credit among the multitude, were too absurd to be listened to by those who were less ignorant; yet, notwithstanding this, I well remember several instances of patients, who had previously been under our care for sore legs, having assured me their wounds had healed by the mere application of rags dipped in this water.

THAT wounds in a healing state should not be prevented from healing by the application of clean water, is not at all strange; and it may thence be imagined, that most of those which did heal, whilst under the use of this water, would have done so equally as soon without it, and I doubt not but all such cases were so considered at that time; yet, from the striking event of the above related case, I cannot help thinking that some of the cures were in consequence of the water itself; and I further suspect, that, had the use of these, and the other celebrated waters before alluded to, been under the direction of persons who could have known that the



too frequent exposure of wounds to the air very much retards their healing, and that the good effects of the application of water, depends, probably, in a great measure, upon the part being kept constantly moist with it, and could, therefore, have pursued the same method which is related in the preceding history, the number of cures would have been greater, and the reputation of the waters have continued longer: but, instead of being used in the most proper way, it may be supposed in a process, the good effect of which was to be produced by a miracle, that very little nicety was observed in doing it, and as poor and ignorant people were the most usual subjects of it, that it labored under the disadvantage of the greatest mismanagement.

## SECTION XV.

*Hernia Humoralis.*

I HAVE no doubt but the preceding method of dissipating heat by topical applications, may, likewise, be advantageously made use of in the hernia humoralis; which is well known to be a symptom of the venereal gonorrhæa, and consists of a swelling and inflammation of the testicles, attended with pain and peculiar sensibility to the touch.

FROM the nature and appearance of this complaint, it is very probable that this uneasiness is in a great measure occasioned by an extraordinary degree of heat being excited in the part, and it is obviously on this

account that relief is to be expected from such a mode of treatment as favors its escape.

MODERN practice has, indeed, for some time past adopted the use of applications of this sort in the hernia humoralis, as the saturnine lotion, brandy and water, &c. and experience has fully proved their efficacy; but their salutary effects have been attributed merely to the astringency and stimulantcy of such topics. Thus Dr. Aikin, in *his ingenious Observations on the external Use of Lead, and on other Topical Medicines*, strongly reprobates the indiscriminate use of emollient poultices in the very case under consideration, and says, that the saturnine water, if made strong, and applied *cold*, will be much more useful: and that he once had a very striking instance of the efficacy of common *astringent and stimulant* applications in the same complaint. He says, “ A person suddenly  
“ attacked in the morning with a swelled  
“ testicle, was obliged, on account of ne-  
cessary

“ cessary business, to walk about all that  
 “ day. I applied a folded handkerchief,  
 “ well soaked with rum, to the part, re-  
 “ tained by another tied round the body.  
 “ This was wetted twice or thrice during  
 “ the day, and at night I found, notwith-  
 “ standing his exercise, that the bulk was  
 “ greatly reduced, and the pain and sensi-  
 “ bility diminished. This application,  
 “ with the addition of vinegar, was con-  
 “ tinued some days longer, and the part  
 “ perfectly recovered without any con-  
 “ finement to the patient \*.”

IT is evident that these applications are  
 precisely the same as those which I should  
 have recommended in the same case on the  
 preceding principle of removing heat; and  
 I have no doubt but the relief which was  
 obtained in the present instance, was in  
 consequence of the heat finding a more

ready escape from the part under such a treatment than it otherwise would have done, and more especially if it had been surrounded with so bad a conducting substance as a thick poultice.

## SECTION



## SECTION XVI.

*Hernia Intestinalis.*

A SIMILAR mode of treating the intestinal hernia offers itself on the same principle, as it appears very probable that the diminution of the bulk of the part, which in this case is the obstacle to its reduction, will be promoted by carrying off the extraordinary degree of heat which is excited under such circumstances, and which, perhaps, in this case, as well as in all other inflammatory swellings, has a greater share in producing the expansion of  
the

the part, than is commonly imagined: and experience seems very sufficiently to have proved the truth of this remark; as the modern practice of surgery has already, in this, as well as in the last recited instance, very successfully made use of means which have obviously this very tendency; the application of cold lotions, water, &c. having, for some time past been substituted in the room of warm poultices; but it has, in this case also, been supposed, that the good effects of such applications have been in consequence of their possessing an astringent and stimulating quality. In the same pamphlet from which I took the extract in the preceding section, Dr. Aikin has observed, that “ the obstacle to the reduction of the contents of the intestinal hernia, is the increased bulk which they have acquired by stricture, making them incapable of returning through the same passage at which they escaped. This is to be removed by such remedies as cause the vessels to contract, thereby diminishing

“ ing the bulk of the solids, and repelling  
 “ the fluids, and not by such as expand the  
 “ solids and make them more yielding to  
 “ the impulse of the fluids. The former  
 “ action belongs to *cold, astringents and stimu-*  
 “ *lants*; the latter to heat and emollients.”  
 And he further illustrates this in the follow-  
 ing case: “ A boy having thrust his penis  
 “ through the ring of a key, it immedi-  
 “ ately swelled in such a manner that he  
 “ could not get it off again, and alarming  
 “ symptoms soon came on; but the cure  
 “ was performed by dipping the part in  
 “ cold water \*.”

THESE remarks, and this instance of the  
 good effects of the application of cold wa-  
 ter, agree perfectly with the foregoing gene-  
 ral theory, by which, I think, its operation  
 may be accounted for more simply, and  
 more satisfactorily, than by the supposition  
 of its stimulancy and astringency; both

\* Page 92.

which qualities, if exercised on an inflamed part, unaccompanied with a quality which had the power of carrying off heat, would, I fear, aggravate rather than alleviate the complaint: and for this reason, I doubt not, but vinegar, brandy, and rectified spirit, the latter of which are considered as the most powerful stimulants, could they be applied in a way in which their disposition to evaporate would be repressed, and at the same time their stimulating power be felt, that they would not produce the salutary effects they are now well known to occasion; and in the present case, in which the part is not denuded of the skin, their application can act upon no other principle than the absorption of heat, which takes place during their evaporation, for unless the cutis be removed, and the more sensible parts which lie underneath be exposed to their immediate influence, their stimulating power cannot be felt.

## SECTION XVII.

*Ophthalmia.*

THE delicate structure of that most valuable organ which is the subject of this complaint, would naturally lead us to be particularly cautious in admitting new methods of treating the various diseases to which it is subject, the foundation of most of which is well known to be long continued and neglected inflammations; I believe, therefore, though the nature of this so obviously points it out as the peculiar object of the general treatment hitherto recommended in all local inflammations, I should have



avoided noticing it in this place, had not experience, in a great measure proved that those applications which tend to carry off heat may be used with the utmost safety.

THE presence of an extraordinary quantity of heat in an inflamed eye appears to me so evident, from the general symptoms of the disease, and the endeavouring to remove it, therefore, is so obviously proper, that I shall confine myself principally to the consideration of those facts and circumstances which lead me to suppose that the common means for that purpose may be made use of without any hazard.

THE very fluid with which nature constantly moistens the globe of the eye, I am persuaded, is useful upon the principle of carrying off that redundant heat which is excited by the frequent motion of the palpebræ: for though this fluid may be generally considered as preventing the common effects of friction, in the manner other lubricating

bricating liquors are known to do, yet it will be found, upon reflection, that the obvious necessity there must be for its being perfectly transparent, does not admit of its being so unctuous, and mucilaginous, as would be requisite for that purpose: being, therefore, thinner and more watery, it is, consequently, more volatile, and by its ready disposition to evaporate, it is, evidently, enabled to carry off that heat which it cannot prevent being excited.

ONE of the most popular remedies for inflamed eyes is cold spring water, and its application in the early stage of such an inflammation has frequently been known to carry it off without any other means being made use of.

BRANDY and water; which, having more volatility than water alone, must be a still more cooling application, is another collyrium of no small reputation in many families; and I know many persons who have  
been

been subject to frequent inflammations from accidental causes, who are persuaded that the constant use of this not only renders their eyes less subject to be inflamed, but when they are so that it very much tends to carry it off.

THE pulp of a rotten apple, which is a moist and cold application, is, likewise, frequently made use of in this disease, and if there be not many instances known of its being very beneficial, there have been enow to prove its being perfectly harmless.

THE aqua saturnina has, for some years past, been prescribed by medical practitioners in the opthalmia; and though it is usually applied cold, I have never heard of any inconveniences from its application, and should imagine if it had not been often found of real use, that it would not have supported its reputation in cases of this kind so long as it has done.

I CANNOT

I CANNOT help thinking, that even the electric aura, emitted from a blunt wooden point, and which has lately been successfully applied in this disease, acts merely by carrying off the heat from the part as a stream of common air. I have myself had frequent opportunities of making this experiment, and have always found that it mitigated the pain during the time of its application, and that the patients never failed to remark that it gave a sensation of coolness particularly grateful to the eye under those circumstances; and I remember one patient who had a very painful inflammation, and found such an alleviation of the pain from its application, that she called upon me three or four times in the day to have it thrown into the eye, but the relief it imparted, though always very great at the time, was but of short duration, seldom lasting more than a quarter of an hour after she left the house. If we admit that the relief which the eye obtains under this application be derived from its favoring the escape  
of

of heat with which the part is so evidently overloaded, it will be no difficult matter to understand that a quick succession of cool air applied immediately to the eye should have this effect, as its operation must be precisely the same as that of the fan and the bellows, as already explained in pages 37, 38, and 39, of the first section.

AND this conjecture is the more probable, as those who have often tried this experiment, must, as well as myself, have found, that when the eye is brought too near the point from whence the aura issues it never fails to make the patient complain, and that, on this account, it is necessary that the eye should be at a considerable distance from it, during the operation.

As a convincing proof that the electric breeze acts upon this principle, the same agreeable sensation, and the same good effects may be produced by throwing air into the eye through a common blow-pipe, though



though in an inferior degree; and this evidently cannot be owing to any difference in the quality of the air, but to the stream being more perfectly divided, and, as it were, radiated when driven by the electric fluid, than it can be when blown through a tube. In fact this is precisely the same thing as an old popular method of treating this disease, which consisted in placing the eye, for some time, near and opposite to the key-hole of a door; and which, I am informed, is still practised in some places, especially in the north of England. Popular methods of treating diseases have, perhaps, originated in the experience of their usefulness in more instances than is commonly imagined; and supposing this to have been the case with regard to the present method, there can be little doubt but it was salutary on the very principle just mentioned, the admission of a stream of air into the eye being evidently the whole of the operation.

I KNOW very well that the principle upon which all these applications, and particularly that of electricity, are supposed to act, is that of astringency and stimulantcy; and I am aware that there are some kinds of inflammations, and other diseases of the eye, in which such powers are likely to be useful, by giving tone to the lax vessels, and enabling them more perfectly to propel the contained fluids; and these are the cases in which the vitriolic lotions have been so salutary: but I am authorised, from the most positive experience, to say that these applications are useful even during the most painful and highly inflammatory state of the eye, in which it is pretty certain that stimulating applications must be injurious; and I have had a recent instance in which the constant use of cold milk and water seemed peculiarly beneficial.

C A S E.

## C A S E.

A GENTLEMAN, who, in two preceding instances, had a very painful and long continued inflammation in both eyes, was a few months ago seized with the same complaint even in an increased degree, as both eyes were excessively inflamed, and attended with exquisite pain.

IN the former attacks he was bled repeatedly, underwent other very copious evacuations, took anodynes, and various warm and soft applications were used to the eyes, as the fofus anodinus of the London dispensatory, emollient poultices, &c. but notwithstanding this the complaint was in both cafes of several weeks duration.

IN the present instance I immediately, as before, took away ten ounces of blood, and ordered a purging draught to be taken the

following morning; but instead of the warm fomentation and poultice, desired that he would keep rags moistened with cold milk and water constantly to the eyes. No other means whatever were used but these, and in twenty-four hours, from my first seeing him, the pain was so much mitigated, and the inflammation abated, that I judged the sole continuance of the cold milk and water would be sufficient for the cure, and which was compleatly effected in three or four days.

It is difficult to compare the degrees of complaints, even when very similar in their symptoms; and there are, doubtlessly, so many hidden circumstances which may hasten or protract a cure, that it is impossible to say that this disease was so precisely resembling the two former attacks of it, that had the same method of treatment been made use of, it would have been of as long  
a con-

a continuance. There is, however, a strong presumption, from the very great difference in the duration of the one and the other, and the apparent similarity in the diseases, that in the latter the use of a different topical application had some share in facilitating the cure, more especially as the obvious tendency of the cold lotion was to carry off what, if not the principal cause of the most urgent symptom, must at least have very much aggravated it.

THE reader will probably remark that cold water was not in this case used simply, and that the addition of milk to it, might, by its emollient quality, have contributed to the relief which was derived from it. The reason for my joining the milk to it, was the same that influenced me in a former instance, namely, my apprehension that cold water alone would have appeared so unmedical, not to say hazardous an application, in so very painful a state of the eye, that it would  
probably



probably not have been used to that degree in which it appeared to me to be likely to answer the purpose of carrying off the heat; and I was at the same time well satisfied, that, being cold and so much diluted, any emollient quality which might reside in the unctuous part of the milk could not be felt.

FROM what has been said, then, I think the liberal use of those applications which tend to carry off heat, may be recommended in inflammations of the eye, and, perhaps, those which are most calculated to produce this effect are wet linen cloths applied to the eyes and kept constantly moist, and the electric aura: and from the peculiarly grateful sensation which is the effect of the latter, I should imagine that heat is most quickly removed by it, and that, therefore, were the operation repeated more frequently, and the eye exposed to its influence much longer at a time than is generally practised, I should be disposed

posed to give the preference to it; excepting, however, in those peculiar cases in which any ulceration may have taken place, in which it is obvious, on the principle which has before been repeatedly mentioned, that the throwing in so large a quantity of air might be prejudicial.

SECTION.

## SECTION XVIII.

*Gout.*

THE nature of this disease is so little understood, that few of the systematic writers on medicine have attempted a theory of it.

IT is evident, however, from the patients who are the peculiar subjects of it, and the circumstances which are well known very often to induce the paroxysms, that an inflammatory diathesis is one of the predisposing causes of it.

IT has been before remarked, that full and high living with regard to diet, indolence,

lence, sedentariness, living chiefly in a warm atmosphere, and other habits of luxury, injure the system by the generation and retention of a preternatural degree of heat, and that these causes contribute very much to produce the gout, experience has very sufficiently proved.

THE disease, moreover, if considered as a local affection of the joints, is likewise a true inflammation; the tumefaction, redness, extreme tenderness, sense of burning, &c. being all symptoms obviously indicating a superabundant heat.

SETTING aside, therefore, the prejudices in favour of keeping the affected part warm, which custom has established, the propriety of cooling applications would seem as evident in the present instance as in most of those other diseases which have before been recited.

I AM, however, aware, that the idea of repelling gouty matter would in this case be particularly urged as an objection to the use of those topics which tend to carry off heat; thick flannels, and such other substances as prevent its escape being supposed to unload the part of this matter by favoring perspiration.

THAT the sweat of gouty persons, and more especially of the parts immediately affected by the disease, is charged with something very unusual must be admitted; but I believe that it has not yet been proved whether the matter which is thus separated, be the cause or the effect of the disease; whether it be deposited in consequence of the extraordinary heat excited and retained on the part, or whether the heat and pain be the effects of this matter endeavouring to pass the skin.

ADMITTING the latter to be the fact, the heat is, at all events, but a symptom; and  
 I cannot



I cannot conceive it likely that the disease should pass off more favorably by the aggravation of such a symptom. There can be no doubt but an accumulation of heat long continued upon a part must be injurious to it, and it appears to me by no means improbable, that the peculiar rigidity of those joints which have endured many fits is principally owing to this single circumstance. It may be easily supposed that the skin, by being repeatedly exposed to the influence of an extraordinary degree of heat, may become so thickened, and its surface be so corrugated and hardened as to be scarce permeable to the perspiratory fluid, and if it be imagined, as above, that the gouty matter usually finds an issue by sweating, it must appear obvious that its escape must by this means be retarded, all future paroxysms be aggravated, and the parts themselves be consequently afterwards liable to sustain more injury.

THAT a certain degree of heat above the natural temperature of the skin is requisite to

induce perspiration has been before observed, but a degree sufficient for this purpose will probably be always excited by the pain alone without any artificial means to increase it; and as an excessive degree of it is supposed to defeat this intention, I rather think that those who have experienced this complaint will be ready to acknowledge that the pain is usually such as to be likely to excite a quantity requiring rather to be reduced than to be increased, even to attain the true sweating point,

THE means universally recommended as preventative of this complaint, and which experience has fully proved to be equal to this purpose, are likewise evidently such as prevent the immoderate generation of heat, and allow of its due escape; as abstinence, exercise, exposure to cold, &c. and surely this affords a presumption that favoring the dissipation of heat from the part affected would, even during the paroxysms, be salutary.

I AM still more confirmed in this idea from some remarks which occur in a paper on this subject in the sixth volume of the London Medical Observations and Inquiries. The\* writer of the observations is at the same time the subject of the case which gave rise to them, and is also a medical man.

AFTER reciting some circumstances respecting his health and the nature of his constitution from his youth, and mentioning that he had for some years before been frequently attacked with the gout, he says,  
“ On my passage to Jamaica in December  
“ 1770, the gout came into one of my feet  
“ a few days before our arrival in that  
“ island. I wrapped it up as I had usually  
“ done in England, with flannel and oil-  
“ skin. I soon suffered excruciating pain;  
“ which induced me to lay aside most of

\* Mr. Alexander Small, late surgeon to the ordnance in the island of Minorca.

“ my wrappers, and my pain soon abated.  
 “ On my arrival at Kingston, in Jamaica,  
 “ my friend Dr. Nafmyth, a most ingenious  
 “ and experienced physician there, advised  
 “ me to lay aside all my wrappers, and to  
 “ keep a cotton stocking only on my foot;  
 “ for experience has taught us, said he, that  
 “ gouty limbs should be kept cool in this  
 “ country. I experienced the benefit of  
 “ following this advice; for the gout soon  
 “ went off.

“ I HAD a return of the gout in March  
 “ following, on my passage to New York;  
 “ and though the weather was cold and  
 “ stormy, I practised the Jamaica cool co-  
 “ vering. I continued to do the same when  
 “ ashore at New York, though the weather  
 “ was frosty.

“ IN the spring of 1772, I had a long  
 “ and severe fit in London; but neglected  
 “ to follow a practice I had received so  
 much

“ much benefit from in Jamaica. I suffered  
“ severely; and I believe for this neglect.”

FURTHER, in mentioning the circumstances attending a future fit, he says,  
“ During this fit, the gout, at times, visited  
“ all my limbs. The pain was less and  
“ continued a shorter time in my hands and  
“ elbows than in my feet and knees. Was  
“ this owing to my hands and elbows being  
“ more exposed to the cool air than the  
“ lower extremities, by being oftener from  
“ under the bed-cloaths, on account of  
“ their being employed in necessary offices  
“ as soon as they became in the least useful?  
“ My right hand suffered less than  
“ the left; perhaps by its having been more  
“ exposed to the cold.”

AND in some subsequent fits, he adds,  
“ In these attacks, I applied no covering by  
“ night or day, but what I usually wore.  
“ The only indulgence I now treat the gout  
“ with in this respect, is not to have any  
“ tight



“ tight binding on the gouty part. If in  
“ the foot, I wear a large shoe; if in the  
“ knee, I do not garter; and if in the hand,  
“ I put on a larger glove in the day. I have  
“ exposed a gouty hand to a pretty severe  
“ cold without being sensible of any incon-  
“ venience from so doing. The inflamma-  
“ tion went on as regularly, and I thought  
“ with less pain, than if carefully wrapped  
“ up.

“ AN ingenious friend of mine, an accu-  
“ rate observer of every circumstance which  
“ can throw light on any subject, to whom  
“ I had mentioned my treatment of the  
“ gout, favored me with the following ac-  
“ count, speaking of himself.

“ ONE night, whilst my foot gave me  
“ more gouty pain, after it was covered in  
“ bed, than before, I put it out of bed,  
“ naked; and perceiving it was easier then,  
“ I let it remain longer uncovered than I at  
“ first intended; till at length I fell fast  
“ asleep,

“ asleep, and it remained in that situation  
“ till morning. The pain did not return,  
“ and I grew well. Next winter, having a  
“ second attack, I repeated the experiment;  
“ not with the like immediate success in  
“ diminishing the pain of the gout; but  
“ constantly with the effect of lessening the  
“ pain, so that it permitted me to sleep every  
“ night. I should mention, that it was  
“ another person who gave me the first inti-  
“ mation of this practice. He being in  
“ the old opinion, that the gout is to be  
“ drawn out by transpiration, and having  
“ heard me say that perspiration is carried  
“ on more copiously when the body is  
“ naked than when it is clothed, put his  
“ foot out of bed, when pained with the  
“ gout, to increase that discharge, and found  
“ ease by it.”

THIS account, which contains the experience of three different persons in the gout, is very strong testimony in favor of the

H h      exposure

exposure to cold; and if added to the foregoing general reasoning upon the subject, will, I think, fully justify the recommending such a mode of treatment, especially in the first attacks of the disease; and which usually occur before the constitution is much impaired, and consequently when the parts can have suffered no injury from prior affections of the complaint.

THE apprehension of the retrocession of gouty matter by a deviation from the usual mode of treating the disease, is, perhaps, but in a few instances well founded; for though the possibility of such a circumstance is admitted by all medical persons, and is constantly the subject of conversation of gouty patients, yet I cannot help thinking that it occurs much less frequently than is commonly supposed; and that when it does take place, that it happens either in those who are much advanced in years, in whom the system has lost much of its natural energy, or in whom the parts which the disease

ease

ease usually attacks have been so much injured by former repeated affections of it, that they are unable to sustain future fits.

AND if it be ever admitted, agreeable to the commonly received opinion, that a certain degree of inflammation of the part is necessary for the safe termination of the paroxysms, it may easily be supposed, that in young, vigorous, and plethoric habits, this will usually be sufficient without any means being used to prevent the escape of heat from it, which, if ever requisite, must, obviously, be only in those subjects in whom, from the before mentioned causes of age, debility, &c. the powers of nature are languid, and the excitation of heat is proportionably small.

## SECTION XIX.

*Local Eruptions and Excoriations.*

**B**Y these I mean those eruptions and excoriations to which young children are particularly subject, and which usually make their appearance behind the ears, under the axillæ, at the back of the necks of those who are very fat, between the nates, &c.

IT has before been remarked that these parts, being very unfavorably situated for the escape of heat, must, necessarily, be more subject to occasional accumulations  
of



of it than the other parts of the body; and it may be further observed, from the circumstance of the contact of those parts to one another, that they must suffer, even from common motion, a more than ordinary excitation of heat, on the principle of friction,

THAT these parts should, therefore, suffer injury from the extraordinary degree of heat produced by the operations of these two causes, is not to be wondered at; and that this injury should consist in the suppuration and partial destruction of the skin, is very probable, from what has before been observed on the effects of similar accumulations of heat on the surface: and in the present instance it seems particularly reasonable to suppose the eruption is produced by such a circumstance, because it is truly a local affection unaccompanied with any other disease, the healthiest children being as subject to it as the most sickly.

LITTLE need, then, be said on the method of treating these complaints, as, admitting the nature of them to be such as is above supposed, it should, obviously, consist in the use of such applications as tend to carry off heat; and it follows, therefore, that frequent washing with the most simple lotions, or even cold water, must be the most likely to answer this purpose, and, consequently, promises to be much more useful than the various greasy applications and thick-spread plasters which are at present so often made use of, but which, from the nature of them, must tend rather to retain than to dissipate heat.

THE necessity of frequently washing children, and particularly in those parts which are the most likely to be affected by these excoriations, cannot but be known to every good nurse; and experience has proved how much a careful attention to this circumstance tends to prevent their taking place; all which the more strongly confirms the foregoing

foregoing conjecture concerning the cause of these eruptions, and proves the general propriety of children being kept constantly cool.

---

IN the preceding sections I have endeavoured to shew some of the effects of an accumulation of heat on the surface of the skin, in producing cutaneous eruptions and inflammations; and it is evident that in these instances I have considered the matter of heat as acting in a sensible state.

IT cannot be doubted but the contrary extreme of an extraordinary diminution of this principle, must, likewise, be productive of injury, and, possibly, the parts which immediately suffer such a privation of heat, may experience morbid affections not less important than any of those which have been recited; and the various degrees of mortifications appear to be of this kind.

AT the same time I cannot help further conjecturing that the deficiency, or superabundance of the matter of heat, considered not merely as existing in a sensible state, but as organically combined with the animal substance, must, also, occasion an important, and probably a morbid difference in the whole system, or in particular parts of the body; and there are two diseases which strike me as peculiar instances of such a difference, the one appearing to be in a great measure, if not totally, the effect of a deficiency, and the other of a redundancy of that material; and these are the scurvy and obesity.

I SHALL, therefore, in the following sections exhibit such facts and circumstances as lead me to these several conjectures, and endeavor to deduce such inferences from them, as may, perhaps, not be without their use in practice.

## SECTION

## SECTION XX.

*Mortifications of the Extremities.*

**I** THINK there can be no doubt but the cause of this disease is the very reverse of those which have been considered as producing the complaints which have been already adduced, for so far from there being an overcharge of heat in sphacelated parts, it is evident that there is a deficiency of it. There are, indeed, some local mortifications which are certainly the effect of an extraordinary degree of heat for a while excited in the part, and which, like the application of a similar cause from without, occasions the destruction of the part immediately under its influence, but in these the habit suffers no



morbid affection, and the diseased part soon separates from the sound, which heals as a common wound. But the kind of mortifications which I allude to are those which come on in the extremities of elderly persons, and which are evidently owing to a gradual diminution of the vital principle in the whole system; these parts, in consequence of which, receiving a supply of heat unequal to their support.

THAT mortifications of this kind are proximately occasioned by a want of natural heat in the part, may be presumed from the extreme parts of the body being the first to experience a deficiency of heat when the general source is diminished, and the circulation becomes languid; which may easily be understood if the blood be considered as the chief vehicle of heat to the different parts of the body; and we recollect that the streams of this warm fluid are smaller in those parts than elsewhere, and as being more remote from the source have, probably, a  
 propor-

proportionately less quantity of heat: and this is also probable from their being frequently induced by external causes which deprive those parts of their wonted and necessary quantum of heat, as exposure to cold, &c.

INDEED this is so obvious, and the common method of treating such complaints is so immediately directed to supply the part with a due degree of heat, both by exciting the general production of it in the system by warm internal cordials and substantial nutritive food, and by endeavoring to call it forth in the part itself by the most stimulating topics; that I should have thought it unnecessary even to have mentioned this disease as connected with the general subject of these pages, were it not to take notice of a practice constantly adopted in the treatment of it, which, though, I believe, originally designed to warm the part, must produce the contrary effect, and consequently be in-

jurious: I mean the indiscriminate use of vinous spirits as a topical application.

FROM its being universally known that rectified spirits are easily inflammable, that they excite heat when taken into the stomach, and give a sensation of smart and burning when applied to any part of the body which is deprived of the skin, as in recent wounds, &c. they have been generally considered as hot, and have been supposed therefore to communicate heat to all bodies in contact with them; but the truth, probably, is, that in those cases in which heat is really produced by their application, it is not derived from the spirit but is called forth from the part itself in contact with it, in consequence of its acrid and stimulating power, in the same manner as aromatic and other stimulating substances excite inflammation and heat: and even this power is too inconsiderable to be felt, unless the sensibility of the part to which it is applied be increased

increased by the removal of the cutis; as every one knows that the finger may remain any length of time in ardent spirits without becoming warmer.

THE washing such parts with spirit of wine, therefore, when the skin is unbroken, must appear, even from this view of the subject, to be attended with no advantage; but were this the only reason for its discontinuance, it might still remain in use, and hold its place amidst the multitude of other medicines, which, though they do no good, have, at least, the negative merit of doing no harm.

A LITTLE reflection will, however, convince us that this is not a mere negative application, for its great readiness to evaporate gives it a power of robbing the part of that very principle which it was intended to communicate. The doctrine of evaporation, as productive of cold, is, at this time, too well understood, and the fact too fully ascertained

ascertained by experiment, to leave any doubt but it must act in this way, and that its effect in rendering the part colder must be so considerable as to be materially injurious in such cases as these,

It may, perhaps, however, be urged that some of the spirit will be absorbed, and that if admitted into the system in this way it may still excite heat; but its volatility is probably too great to suffer it to remain long enough on the part to have much of it absorbed, and as absorption is an operation of nature, perhaps, requiring considerable vital power, it is not likely that it should be carried on to any considerable extent in the languid and feeble state of a morbid limb.

WE may conclude, then, without hesitation, that the application of spirit to a sphacelated part can alone be useful when some degree of separation has taken place, or when scarifications have been made through its substance so as to expose the more sensible  
parts



parts underneath to its immediate influence, and as the common practice of bathing the whole limb, which in such cases is frequently œdematous and cold, with it, is evidently injurious, that it would be much more likely to answer the purpose of warming and invigorating the limb to rub it frequently, to apply warm and greasy poultices to the part most particularly affected, and to keep the whole wrapped up in thick and dry flannel.

My practice has lately furnished me with a very singular instance of the good effects of preventing the escape of heat from a sphacelated limb, and which shews at the same time the very near connection there is between the powers of life and animal heat.

## C A S E.

IN December 1784, I visited a lady about 63 years of age, who had been ill more than  
a fortnight

a fortnight of a highly putrid fever. For six or seven days before I saw her, a livid discoloration of the lower arm as far as the elbow had taken place; a gangrene of considerable extent had likewise formed on the lower part of the back, another on each hip, and the toes of one foot were blueish. The tongue being also remarkably foul and dark-colored, the pulse scarce perceptible; and every limb incessantly in motion, from the twitchings of the tendons, indicated the dreadfully morbid and feeble state of the whole system, and threatened a near approaching dissolution.

THE apprehension that she had been for some days actually in a dying state, had prevented the requisite attention to these sphacelated parts, and through a peculiar inadvertence, the whole arm had been almost constantly exposed on the outside of the bed.

WHEN I first saw her, the limb in question was much swollen, and felt to the touch

touch extremely cold ; its appearance from the extremities of the fingers to the elbow was of a deeply livid color, there were several vesications on the upper surface of the hand, and the pulse was totally imperceptible.

THOUGH the deplorable state of my patient afforded scarce a possibility that the most powerful means could be of any material use, yet it did not, in my opinion, justify the total neglect of those which her case so obviously indicated, and which I therefore recommended to be had immediate recourse to. I shall, however, confine myself merely to the treatment of the diseased arm.

I ORDERED it to be well fomented, to be wiped dry, and then wrapped up in fine flannel several times folded, and not to be opened until I saw her again, and which was in about six hours after. The limb had in this time acquired considerable warmth, and the discoloration towards the elbow was

K k much

much less livid. It was therefore again well fomented and wrapped in the same flannels, in which state it was left more than twelve hours, namely, till the next morning. The discoloration of the upper part was now totally gone, it was livid a very little way above the wrist, and the whole limb was perfectly warm. The same means were still used for several days, at the end of which the discoloration was confined to the thumb, the extremities of the fingers, and to one side of the hand; and the back of the hand had nearly acquired its natural color. At this time, also, the swelling of the arm being perfectly subsided, I could distinctly feel the pulsation of the artery.

ON account of the vesications on the the thumb and hand, I now directed those parts to be surrounded with a thick warm poultice, but fomented, as usual, before the application of it. This method was therefore continued, and the appearance of  
the

the sphacelated parts became daily more favourable; but notwithstanding this she expired on the sixth day from my seeing her.

SHE had taken no cortex before I saw her, and during the time of my attendance I was unable to give her more than two half pints of a strong decoction of it. Much pains were, however, taken to get down nourishment, and with which she took a tolerable quantity of red wine; all which, certainly, as far as they operated, tended to give vigor to the system, of which, doubtlessly, the sphacelated limb participated: but the cause of the favourable alteration which took place in it so soon after my first seeing her, and what principally effected the general change in the limb afterwards, I am persuaded, was the mere prevention of the further escape of heat from it, and the consequent gradual accumulation of that small quantity which still remained in it.



THE vital principle being by these simple means so much restored in the limb, notwithstanding the near approach of the patient's death, and the consequent extreme feebleness of that principle, is a very striking fact, and strongly indicates the importance of a greater attention to this circumstance, in similar affections, than is usually paid by medical practitioners.

## SECTION

## SECTION XXI.

*Scurvy.*

THE various histories of this extraordinary disease, which have been given by medical writers, and the accounts of its occurrence in different ages, seasons, and climates, all agree so remarkably in the circumstances which dispose to it, and these circumstances so directly tending (according to the preceding theory of the production of animal heat, and of its escape by the surface,) both to lessen the generation of heat within the body, and to promote its escape by the surface, that I cannot help considering the primary cause of it to be a deficiency of the matter of heat in the system.

THE

THE two principal causes which I allude to as producing the scurvy, are, long continued exposure to cold, and living a long time upon bad and not easily digested food; the latter affording too small a supply of animal heat, and the former too quickly carrying off that which is generated; and which appears still more probable, as either of these causes singly, if operating to a considerable extent, will produce this malady.

THE season of the year in which the scurvy is most rife is well known to be the winter, and those countries are the most subject to it which are the least under the sun's influence.

DR. Lind, whose elaborate treatise on this disease contains a large collection of very important facts respecting it, and which, therefore, whether his theory of it be true or false, must always be very valuable, says, "The ships which are annually employed in the whale fishery, are, of all others, the

“ the best fitted out, both as to the variety  
 “ and quality of their food; the voyage is  
 “ short, and the seamen kept much in ac-  
 “ tion; so that bad water and decayed pro-  
 “ visions can scarcely fall to their share.  
 “ Yet it is notoriously known that there is  
 “ no part of the world where ships crews  
 “ are so liable to the scurvy, as in the polar  
 “ circle. Those who are seized at their first  
 “ entrance into the cold, find an increase of  
 “ their symptoms when got into the ice.  
 “ The attack of the malady is here more  
 “ sudden, and its progress more rapid, than  
 “ any where else. The patient has seldom  
 “ any cure or alleviation till the weather  
 “ softens \*.”

THE same author, in another publica-  
 tion †, observes, “ The sailors in winter,  
 “ and especially such of them as visit the

\* Page 214.

† Essay on the most effectual Means of preserving the  
 Health of Seamen. Page 24.

“ Greenland seas, to be remarkable for a  
“ voracious appetite, and a strong digestion  
“ of hard salted meats, and the coarsest  
“ fare:” and I think this circumstance very  
strongly supports the conjecture, that an extraordinary waste of animal heat excites in the stomach a more than usual appetite for food, on the principle of producing a proportionate supply of it under such circumstances, and that, particularly in this instance, it may be considered as a happy effort of nature to guard against a disease which a deficiency of this important principle seems to occasion.

THIS complaint will, in like manner, be induced in situations where the cold is not intense, if persons live for a considerable time on bad provisions; such a degree of it, as is produced merely by a moist atmosphere, even in a warm climate, being sufficient to bring it on. Sailors in long voyages are precisely in this situation, living for a long while on hard, dry, and salted meat, which, obviously, must



must be of difficult digestion, and from which, consequently, the matter of heat cannot be extricated in such abundance, as if this process in the stomach were more easily and more perfectly effected. Dr. Lind says, “ It is observable, that in warm climates, the crews of ships at sea are liable to this malady, when the hot weather, by which the fibres of the body are much relaxed, is succeeded by great and incessant rains usual in those latitudes. The disease is there, likewise, much owing to the great length of those southern voyages. But otherwise it is not near so frequent a calamity as in cold climates; the bad effects of moisture being rendered much more pernicious when combined with cold. A *cold and moist* constitution of the atmosphere, together with wet lodgings, damp beds, cloaths, and other inconveniences which poor people necessarily suffer in such seasons,

“ is the most frequent and strongest disposing cause to it\*.”

IT having been observed, that a moist state of the atmosphere always aggravates the disease, whether primarily produced by living on bad provisions, or to being in a cold climate, the best writers have supposed the proximate cause of the disease to be a suppressed perspiration occasioned by such moisture in the air; and much ingenious and plausible reasoning has been made use of to account for it on this principle, from a supposition that many foul and gross particles are retained in the system, which would have been carried off by perspiration, and which, by their peculiar noxious qualities, corrupt the habit, and bring on the various symptoms of the scurvy. But I conceive the ill effects of moisture in in-

\* Treatise on the Scurvy. Page 229.

ducing

ducing or increasing this disease, to be solely produced by its power of promoting cold; a moist air of the same, or even a higher temperature than a dry air having been before observed to carry off heat from the animal body much more quickly.

PREVIOUS indisposition by fever, diarrhoea, hæmorrhage, and other diseases which waste the body and reduce the animal strength, have always been observed to act, likewise, as occasional causes of the scurvy; patients under such circumstances being soonest affected by those causes which have been before mentioned as more immediately producing the disease. Nor does this seem at all repugnant to the preceding theory, as it cannot be doubted but such causes greatly diminish animal heat, and, consequently, render the patient less able to endure the further diminution of heat occasioned by an inadequate supply of it within, or the too great waste of it externally.

IN all the melancholy accounts which have been recorded of this dreadful disease, as making its appearance among the crews of ships in long voyages, among the wretched inhabitants of besieged towns, among soldiers encamped in cold climates in the winter time, or among those unhappy persons who have been obliged to pass the winter within the frigid zone, it is observed always to have been most severe with those who have been most exposed to the inclemency of the weather, who have been the most thinly clad, and who have lived upon the most ordinary food; those only escaping who have had opportunities of keeping themselves warm, and who have lived upon a better diet. And hence we may well understand why the disease should, in the same place, so differently affect not only a few individuals (in whom some accidental constitutional circumstances might possibly occasion a difference), but even whole bodies and societies. When towns have been invested, and the troops which have defended them

them have been composed of regiments belonging to different nations, some of which have been better cloathed, fed, and accomodated, than others, it has often happened, though they have all necessarily lived contiguously; and have had constant intercourse, that, while some whole regiments have been severely attacked by the disease, others have had it but in a slight degree, and others have totally escaped it\*. And it is, also, notorious, from numberless instances, that on board ships, whilst the disease is making the greatest havoc among the seamen, that the officers are frequently totally free from it†.

MANY of the symptoms of the scurvy indicate, likewise, an extraordinary waste of nutriment, and a deficiency of animal heat;  
“ a great wasting of the animal substance,  
“ an increased appetite for food, a pale and

\* SEE Dr. Lind's Account of the Scurvy, as it appeared at the Siege of Breda. Page 339.

† DR. Mac Bride's Experimental Essays. Page 176.



“ livid complexion of the skin, and a general loss of strength,” having been noticed among its symptoms by the earliest writers on this disease §.

THE broken texture of the blood, and the want of firmness and tenacity in the fleshy and more solid parts, which are marks so peculiarly characteristic of this disease, may, also, I think, be accounted for on the same principle of a deficiency of the matter of heat, considered as one of the materials in the animal compound. If the adipose parts be considered as the general connecting medium and bond of union of animal substance, and which anatomical dissection seems to render highly probable; and if, according to a former conjecture\*, this substance be, in any degree, proportioned to the quantity of the matter of heat generated and deposited in the system, it follows, that,

§ Woodall.

\* Section I. Pages 19, 20, 21.

when a deficiency of this material obtains to a considerable degree, it must be manifest in the waste of the adipose substance, the consequence of which, must, obviously, be a want of that firmness and cohesion of the parts, which its presence so much contributes to produce. The loose texture of the blood may, perhaps, be, also, explained upon the same principle, as it appears to me very probable, that its tenacity is much owing to a proper quantity of unctuous matter constituting a part of it. And even setting aside this conjecture respecting the adipose substance as proportioned to the matter of heat deposited in the system, this fact of the want of tenacity in the animal substance when affected by this disease, may still be explained equally simply, as it is evident that the deficiency or privation of any one of the materials requisite for a perfect animal compound, must produce a tendency to the decomposition of the whole, the most obvious mark of which must necessarily be a diminished cohesion of the other several parts.

It

IT was remarked in the preceding section, that the degree of the vital principle depended much on the presence of the matter of heat, and a very striking instance of this was adduced in the case of the sphacelated limb. The peculiar livid appearance of parts in such a state, and which, from the circumstances of the before mentioned history, may well be considered as preternaturally deprived of the matter of heat, must be well known to surgeons very much to resemble a scorbutic affection; and even in cases where the rest of the system is in perfect soundness, such a local affection, and which may not improperly be termed a local scurvy, is often produced by mere exposure to cold. Part of the winter employment of the husbandry of Norfolk exposes the servants of farmers to frequent and very severe cold, and is attended, at the same time, with too little exercise to excite any warmth in their bodies; I mean in pulling turnips, &c. The injurious effect of this kind of work in severe winters is evident on  
the

the hands and feet of those who are engaged in it, and especially in the former, as being more exposed to the air, and most frequently in contact with the cold bodies. These parts soon become livid and swollen, acquire a peculiar rigidity, and lose their sensibility, the skin frequently breaks, and very ill conditioned sores, which discharge a thin bloody lymph, and which are difficult to heal, are the consequences. I need not observe, that the chilblain, which is a disease of those parts which are the most remote from the source of heat, and is peculiar to winter time and cold weather, agrees, also, very much with this description.

It cannot but be acknowledged that these appearances very much resemble a true scurvy, and were the whole system affected in the same way, there is no doubt but they would be considered as such.

BUT though it is evident that the sole cause of this affection is a long continued

M m                      diminution

diminution of heat in the parts, yet a distinction must be made between this effect of cold, and the more sudden effects of extreme cold in cases of frozen limbs; in the latter cases, probably, the injury being owing to a sudden and total stop being put to the circulation in the part, and which, if not soon and sufficiently restored, occasions its death, or, to use a more technical term, a mortification; whereas, in the present case, as well as in the true scurvy, the disease appears rather to be owing to a gradual and continued diminution of heat in the part, effecting, perhaps, chiefly a loss of that heat which should become an organic part of the animal compound, in an absolute state, and inducing, in consequence of such a deficiency, a chemical difference in the constituent parts of the substance: for if, in the common œconomy of animal life, a certain portion of that heat which is generated within the body, be deposited in the animal substance and combined with it, as one of the material parts necessary for its perfection



tion as an animal compound, it follows, if this be prevented taking place in any particular part or in the whole body, by such a quantity of heat being constantly carried off as shall not leave a sufficiency for this purpose, that an injury must be suffered by such a privation; and that the injury should be of the nature just described, many of the preceding facts seem to render very probable.

THE causes, symptoms, and appearances, of this disease, which have been mentioned, I think may be considered as sufficiently agreeing with the preceding theory; it remains to enquire whether the means which have been experienced to cure the disease support the same general conjecture.

THE old medical adage of *contraria contrariis medentur* is perhaps in no disease more strikingly exemplified than in the scurvy.

As the too small generation of heat, by living too long upon food which affords an inadequate supply of it, and the too great waste of it by a long continued exposure to cold, so evidently produce this complaint, so the use of food, which, from being easily digestible, more quickly, and to a greater degree, imparts this important material to the system, and the living in situations less exposed to the waste of it, never fail to cure it; the former, however, being more instrumental in its removal than the latter, and of the former fresh vegetables being the most salutary.

THAT the use of good food should be most efficacious in the cure of the scurvy, is perfectly agreeable to the preceding theory of the production of animal heat, as according to that, the restoration of the balance of heat, as an organic part in the system, can be alone obtained from this source. Exposure to cold may, indeed, as is the fact, be as instrumental in the production of the scurvy

scurvy as bad food, as the too great waste of heat must, obviously, as soon produce a deficiency as the too little supply of it; but when once the deficiency has taken place, and this disease is its consequence, the regeneration of it can, evidently, be alone derived from a due supply of proper food.

It has been before remarked that the separation of heat from the different articles of food, most probably takes place during their decomposition in the stomach: It cannot be doubted but some kinds of food more readily undergo this process than others; and the texture of green vegetables being more loose and less tenacious than that of any other article of food, it may easily be imagined that they will most readily, quickly, and perfectly, undergo the digestive process.

VARIOUS theories have been conceived by different writers to account for this salutary effect of vegetable food; with some it has been attributed to “*a saponaceous, attenuating*

*ating and resolving virtue in vegetables\**," (terms, which, as applied to the cure of the present disease, I confess, convey no idea to me,) and modern chemists profiting by the more compleat analysis they have been able to make of vegetable substances, have discovered other principles in them, to which they have ascribed their extraordinary effects.

DR. Macbride supposes that the fixed air which escapes during the decomposition of vegetables has the greatest share in promoting the cure of the scurvy; and this he is the more disposed to believe, from a persuasion of its being the principal connecting medium and bond of union in those substances which contain it; and for this reason he recommends the use of malt and other saccharine farinacea, sugar, melasses, spruce beer, and all other substances which in fermentation afford a liberal supply of this material.

\* DR. Lind, Page 250.

I AM, however, much doubtful of this salutary quality residing in fixed air, seeing no reason why the good effects of vegetable food should be ascribed to this alone of all the principles set at liberty by its decomposition; nor why the cementing principle, upon which Dr. Macbride seems to lay such great stress, should belong to this, rather than to any other of the constituent parts of a vegetable body; as it appears to me very probable that the separation of any one of them will alike destroy the union of the whole.

IT is, yet, clearly evident, from the many accounts of cures in the scurvy being effected by such small quantities of vegetables, as cannot be supposed to afford an adequate supply of nutriment, that they must be considered in some other light than as mere food.

FROM what was before observed of their loose texture, I rather think that their salutariness



tariness depends, in a great measure, upon their readiness to undergo the fermentatory process, and whilst they are undergoing that process, upon their power of communicating the same disposition to the other articles of food, with which they mix in the stomach; acting upon them, probably, as an exciting ferment, in some such way as the addition of yeast to dough and wort promotes their respective fermentations.

The experiments of Dr. Macbride\* seem not a little to confirm this conjecture, as they, evidently, tend to prove that the decomposition of animal substance is much assisted by the mixture of vegetable. And even Dr. Lind seems to have been aware of this power in vegetables, “ being of opinion, for several reasons, that the fermentative quality of vegetables, is somehow necessary to the perfection of animal digestion†.”

\* Experimental Essays. Page 35

† Treatise on the Scurvy. Page 253.

IF, then, these premises be admitted, the use of vegetable food will be found to be ultimately derived from its power of promoting the digestive process; the imperfection of which, as preventing the adequate generation of animal heat, I have considered as powerfully contributing to this disease, and which, I think, may be considered as strongly supported by this circumstance.

THE mode of treating this disease, as suggested by the preceding general theory of its cause, is sufficiently obvious, and, indeed, has already been adopted with such success as manifestly to prove the propriety of it. At the same time it shews, in the strongest manner, the importance of an attention to the circumstances which seem so instrumental in producing it, in our endeavours to prevent it; and that this is really practicable much oftener than has hitherto been imagined, not only appears probable, from reasoning upon the foregoing premises, but, I think, has been satisfactorily ascertained by

N n                      experiment

experiment in the peculiar healthiness and almost total exemption from the scurvy, of the crews in the late celebrated circumnavigations of the globe; and which appear to have been produced by a strict attention having been paid to diet, cloathing, exercise, ventilation, and cleanliness; the two first contributing to prevent a deficiency of the matter of heat, and the others obviously tending to prevent the other occasional causes of this disease from general indisposition.

THE prophylaxis of this disease being so peculiarly important, it may be worth while more particularly to consider these several means of its prevention, as agreeing with the preceding theory, and as attainable in the common circumstances and situations most liable to it; I mean in long sea voyages.

Food, as it is good or bad, though so materially concerned in causing or preventing the scurvy, is, unfortunately, in long voyages,

voyages, of a nature ill adapted to afford an adequate supply of heat and nutriment. The very means which are necessarily used to preserve it for a considerable length of time, (and which must, obviously, be such as enable it to resist the common process of its decomposition by putrefaction,) most evidently hindering it from undergoing the digestive process in the stomach so readily and perfectly as it would otherwise do,

THE means which give animal substance the power of resisting putrefaction, commonly made use of, are the impregnating it with salt, and the depriving it of all moisture. The first, probably, acting as a coat or covering to it, and as, being enabled, when dissolved, to fill up every interstice, compleatly sheathing and defending it from the contact of the surrounding air, which is well known to be necessary to the process of putrefaction, and the second evidently excluding the other principle which very much promotes it.



If, then, there be no other means of preserving animal substance but what will render it difficult to digest\*, this inconvenience must be submitted to in very long voyages; and our next enquiry must be whether

\* AN ingenious friend of mine, to whom I have often been obliged for philosophical information, has suggested to me the possibility of preserving animal substance, upon a principle very different to any yet made use of; namely, by keeping it suspended in inflammable air. He has made this experiment at different times, and with different kinds of meat, and has found them remain perfectly sweet for several months, and even during the summer's temperature.

THE chemical principle on which this is effected, must, evidently, be the same as that which prevents the combustion of bodies when surrounded with air which is already saturated with the material which escapes during that process. Air capable of absorbing phlogiston is, in like manner, requisite for the putrefactive process of animal substance; and, if the air in contact with it be (as is the case with inflammable air) incapable of receiving this principle, the process must, obviously, cease.

THERE can be no doubt, therefore, both from theory and experiment, but animal substance may be preserved under these circumstances, and I mention it as certainly a very striking fact; at the same time, on account of the great



ther any other kind of food taken at the same time will not promote its more ready solution.

It

great expence of the materials from which inflammable air is produced, from the trouble attending the process of making it, and from the great difficulty there would be in providing vessels sufficiently large, and at the same time sufficiently air-tight to preserve it in, it is much to be doubted whether it could be practicable on so large a scale as would be necessary to make it useful for the present purpose.

It were, however, to be wished, that some further experiments of this kind were made at sea, by which would be known whether any different effects would be produced by the variations of climates, and whether inflammable air, when under the different circumstances of being more expanded in a hot atmosphere, and being condensed in colder ones, would still, in an equal degree, preserve its power of preventing the putrefaction of these substances.

OTHER experiments might also be made to preserve animal substance on the mere principle of preventing the access of the external air. I am told that an Italian author mentions his having preserved meat a long while by keeping it compleatly immersed in oil; and I think other modes of excluding the air might be made use of. In climates which are not very warm, pieces of animal flesh might be compleatly covered with mutton suet, or bees wax, and even in the warmest, they might be further covered

IT has already been suggested, that vegetables have this valuable property, but it will be in vain that they possess this quality, if it be confined to fresh vegetables, which it, evidently, must be as impossible to procure in long voyages as fresh animal food. Vegetable substance is, however, found under a greater variety of forms than animal substance; and under some of those forms it ad-

vered with pitch or resin or some such-like composition; and if any other substance which did not communicate a disagreeable taste were interposed between the meat and this covering, as lard or suet, I see no reason why the meat so kept should be either unpleasant or unwholesome.

AMONG the captains of ships there must certainly be many who are very intelligent men, and who must be easily convinced of the usefulness of such experiments; and the sea surgeons must, also, be particularly excited, even by the nature of their office, to pay attention to them. I would, therefore, strongly recommend these and such-like trials to be made; and as experiments, in appearance even trifling, sometimes lead to important discoveries, and as those which I have mentioned, whilst made upon a small scale, cannot be attended with much trouble or expence, I should hope some persons will at least be induced to attempt them.

mits of longer and more perfect preservation than animal substance. Some fruits, most seeds, and many roots, are of this kind; as are also some of the vegetable preparations, as malt, sugar, treacle, conserves, &c. and though all these, probably, fall far short of fresh green vegetables in their readiness to digest, yet they certainly undergo that process much more easily than hard and salted animal food.

THE supposed efficacy of fixed air in preventing and curing the scurvy, as suggested by Dr. Macbride, has already been noticed; and though I am not disposed to attribute the salutariness of vegetables to this principle, yet, I confess, I should prefer the use of those which most readily give out fixed air, this being a proof that they most easily undergo the fermentatory process, and that, consequently, the change in them requisite for digestion in the stomach is duly effected.

WERE

WERE fixed air, merely as such, so useful in the cure of the scurvy as has been imagined, it might be obtained from other substances as abundantly as from vegetables, and which there could be no difficulty in preserving in the longest voyages; but I believe there are no proofs of its efficacy, unless when immediately derived from vegetables, and even unless extricated from them in the stomach: it may, moreover, be remarked, that green vegetables contain less fixed air than the farinaceous seeds, and saccharine juices of plants, as sugar, &c. and yet it cannot be denied but the former are much more antiscorbutic than the latter.

THE reason why such a medicinal virtue has been attributed to fixed air has, however, probably, been merely because this principle is so abundant in vegetables, and is, perhaps, the first to be obvious in their decomposition; and for a similar reason, the various kinds of acids have been considered as antiscorbutic, because some vegetable juices, as  
that

that of lemons and other fruits, have been found so; and this has given rise to the use of vitriol, &c. but I believe experience has sufficiently proved their inefficacy both in preventing and curing the disease\*, and that these different juices of fruits have not been useful as acids, but simply as vegetable juices capable of undergoing the fermentatory change in the stomach.

FROM what has been said on the subject of animal and vegetable food, it may be inferred that animal meat which is hard, dry, and salted, and which, consequently, strongly resists every process of decomposition, must, as not affording an adequate supply of heat and nourishment, be very improper to live upon for a considerable length of time; and that all vegetables and vegetable preparations, as more readily undergoing the necessary process in the stomach, and as being supposed, likewise, even to assist the digestion of the other food, must, at all times,

\* DR. Lind's Treatise on the Scurvy. Page 157.



be salutary; and that, therefore, such quantities of the various kinds of the latter as can be procured, and will admit of preservation, should be provided for long voyages, that they may not only form a considerable part of the food which is daily made use of, but even, if possible, admit the diminution of the present allowance of salted meat.

THE custom of dram drinking, so prevalent among common sailors, and which is certainly encouraged by the ship's allowance of spirits as a part of the crew's provision, is, I am persuaded, in the highest degree pernicious, and, I doubt not, has a great share in bringing on the scurvy. As the appetite for food is evidently lessened, and the powers of digestion impaired by the use of spirituous liquors, they must be particularly injurious under circumstances which require a more than usual supply of aliment, and the most vigorous exertions of the digestive faculties.

I BELIEVE

I BELIEVE it is usual in the navy, when the small beer is exhausted, or become unfit for drinking, to allow a certain quantity of rum, brandy, or gin, instead of it, as a common beverage; and as the small beer can be brewed only on shore, and a warmer climate or season soon renders it unfit for use, it is clear that in some voyages the sailors must be chiefly supplied with spirits during the whole of them. It is much to be wished that this were otherwise: Spruce beer, which may so conveniently be made in all climates and seasons, would certainly be a much better substitute for small beer; or if the peculiar taste of the spruce be such as to prevent the sailors from relishing it as a common drink, I see no reason why the spruce may not be wholly omitted, and the beer be made with the treacle only. The antiscorbutic quality of this beer appears to me to be chiefly derived from the vegetable matter of the treacle; and it is very evident that it is from the fermentation of this only that the vinous state of this liquor is pro-

duced; and to those who think the anti-scorbutic virtue resides in the fixed air, I may add that this principle is likewise solely derived from the treacle: the addition of spruce, at least of its extract, or essence, as it is improperly called, (I speak in the common language of chemistry) and which, probably, is much the same as common tar, perhaps having no other effect upon it than to impart to it a peculiar flavor, and possibly to make it keep a little longer than it would otherwise do. Were it boiled with hops it would probably keep as long as when made with the spruce, its taste would certainly much more resemble malt liquor, and I can see no reason why it should not be as salutary as common small beer. Indeed, according to chemical analysis, it must very much resemble malt beer; in both liquors, the material inducing that fermentatory process which produces beer, being the saccharine juice of a vegetable, differing perhaps only in the unessential circumstance of the peculiar flavor of the vegetable which produced

duced it, the one being derived from the sugar-cane, and the other from barley.

BUT admitting that the before mentioned custom of the navy has so habituated sailors to the use of spirits that they will not totally forego it, they certainly ought not to be indulged with it in a raw state: if they must have it, a moderate quantity of it might be mixed with the treacle beer. This would certainly be as palatable and equally as wholesome as a liquor recommended by Dr. Lind, and much used among the Russians, under the name of *ashbetten*\*, and which consists of small beer, gin, treacle, and vinegar.

THE use of sweet wort, malt meal, malt rob, &c. being all obviously proper on the general principles of the foregoing remarks, need not be particularly noticed.

\* DR. Lind's Essay on the most effectual Way of preserving the Health of Seamen. Page 14.

IT appearing, therefore, that an attention to food is important, as its object is the keeping up the due internal generation of heat, the next circumstance of consequence is to prevent the too free escape of it externally.

IN the first section of this essay it has been shewn that the matter of heat is constantly escaping from all animals, and that this is more or less as the surrounding medium or other substances in contact with the body are quick or slow conductors of it.

THE different conducting power of the atmosphere depends upon its degree of heat as relative to that of animal bodies, and to its degree of moisture; and as these vary according to seasons and climates, it is obviously not in our power to regulate them. Happily, however, there are means by which the undue escape of heat from the body may be prevented even in the coldest climates; I mean by external covering.

THERE



THERE are many circumstances which have been mentioned in the course of the preceding pages which seem strongly to prove that the effects of exposure to cold very much resemble those which are produced by the office of the stomach being imperfectly performed (both which, as we have before remarked, agreeing in the circumstance of diminishing the general heat of the system), and which, likewise, shew that when a more than usual quantity of heat escapes externally, the endeavor to promote the internal supply is increased; in the voyages to the frigid regions of the north, this effort is singularly manifest in the voracious appetites of the sailors; as appears from a quotation already made from Dr. Lind\*.

THIS happy effort of nature to make up the loss of heat occasioned by extraordinary

\* ESSAY on the most effectual Means of preserving the Health of Seamen. Page 14. And the Bishop of Bergen's History of Norway. Vol. II. page 271.

exposure to cold, and which, doubtless, in many instances prevents the attack of the scurvy, or lessens its virulence, should certainly lead us to imitate the same endeavor in the other circumstances which may induce the disease; and when the nature of the food on which sailors must live for a considerable length of time is unavoidably such, that the supply of heat from it is necessarily less than usual, to prevent the too great waste of it externally by a more than ordinary covering.

IN this view the article of cloathing appears peculiarly important in our endeavors to guard against the scurvy, and I am persuaded that an attention to it will be found more instrumental in preventing the disease than is commonly imagined.

Good cloathing, indeed, so obviously tends to promote the comfort and general health of persons who are exposed to inclemencies of weather, that it cannot have been  
overlooked

overlooked by those who have paid any attention to the subject; and it has, likewise, already been recommended in the very light I now consider it; I mean as necessary to prevent the attack of the scurvy in cold and exposed situations. In Dr. Macbride's Essay on the Scurvy, published with his other ingenious Experimental Essays on Medical and Philosophical Subjects, he appears so fully convinced that the disease would be often prevented, and always lessened in its malignity if the sailors were better cloathed than they usually are; that he urges an immediate attention to this from those who superintend the naval affairs of this kingdom with a degree of earnestness and even enthusiasm that proves his strong regard for the interests of humanity, and reflects the highest credit on his benevolence\*.

It is, indeed, much to be lamented, that, of the two means which appear to be so instrumental in preventing this disease, this

\* Page 175, 176, &c.

should be so much neglected; more especially as of the two it is, perhaps, that only which is totally within our power. In some voyages, it is evident that it will be absolutely impracticable to have the food such as is quite proper, but there can possibly, in no situation, be any impediment to the use of cloathing, nor any difficulty in adapting the proper kind to the necessity there may be for it. Every one knows, and must in this climate have experienced the great power which all woollen materials of a rare and loose texture, as flannels, &c. have in preserving the warmth of the body: and there can be no doubt, therefore, but in the coldest seasons and situations, a requisite quantity of such covering will retain so much heat in the body as to render it insensible to the surrounding medium. Even when the excitation of heat is unassisted by motion and exercise, as in the perfect stillness of sleep, if the body be but properly covered, no one experiences cold in the severest weather.

IT

IT can scarce be necessary to add, that, on the same principle of preventing the undue escape of heat, moist cloaths, damp beds, &c. must be particularly avoided; and that the use of fires in moist weather, in all parts of ships which can admit of them, must be equally proper.

THE other articles which have been mentioned as demanding attention in our endeavors to prevent the scurvy, are exercise, pure air, and cleanliness. Though the effects of these may be considered as only generally conducive to health, and not as immediately respecting the present disease; yet as previous indisposition even from complaints which bear no relation to the scurvy, renders patients more liable to be affected by it, and very much aggravates the disease when existing, there can be no doubt of the propriety of a strict attention to these several circumstances in the present instance.



THE methods necessary for these purposes are so obvious, and have been so repeatedly mentioned by different medical writers, and particularly by Dr. Lind, that it cannot in this place be necessary to relate them, the mere recommendation of them as evidently proper, from the foregoing reasons, being, I trust, fully sufficient for my purpose.

## SECTION

## SECTION XXII.

*Obesity.*

**I**F a superabundance of fat were in no instance injurious to health, and, therefore, never merited the name of a disease, the inconveniences derived from it are, yet, such as to make the removal of it a very desirable circumstance, and it has, therefore, not unfrequently, been the subject of medical attention.

THERE is a certain age at which the body is peculiarly disposed to acquire bulk by an increase of the cellular substance, and this is usually soon after the adult growth is obtained; which disposition commonly continues untill the subject passes mature age, beyond which period, and during

ing old age, there is observed a great diminution of this substance, in consequence of which, the interstices of the muscles being no longer filled up, and the external integuments distended, the plumpness of the skin peculiar to youth and manhood ceases, the figure of the muscles becomes more apparent, and deep lines and wrinkles are produced.

BUT this gradual increase and diminution of the adipose substance depends, probably, upon some general law which affects animal growth and decay, and as it therefore obtains universally to a certain degree, it cannot be the subject of the present enquiry; that which is meant being, obviously, a deviation from such a general law, and the degree of fat being in this case preternatural.

THERE is, however, certainly, a very great difference to be observed in persons respecting the quantity of their fat, though their general mode of living, and the nature of  
their

their employments be much alike; and which would seem to prove that there is a much greater natural and constitutional disposition in some persons to grow fat than in others, or, perhaps, that the circumstances which are conducive to this effect are not sufficiently understood.

IT was observed in the first section of this essay, that an excess of food, inactivity of the body, and living much in a warm atmosphere disposed to fatness, and I need not add that I considered the latter as not a little conducive to it.

THE means which have been hitherto used with a view to the removal of obesity, are exercise, abstinence, and an increase of the common evacuations, by purging and sweating, and particularly the latter when a sudden reduction has been aimed at.

THE tendency of all these to produce this effect must be obvious, and the moderate  
use

use of the two first, namely, abstinence and exercise, can, in no instance, be injurious, but the latter, as being evidently contrary to nature, must, if long persevered in, be attended with hazard. It would be, therefore, of no small importance in our endeavors to prevent extraordinary accumulations of fat, or to reduce superabundances, to be able to succeed by the use of those means only which are perfectly safe.

A QUANTITY of nutriment, (whatever be its peculiar nature) admitted into the system, more than is sufficient for animal support, must, in all cases, be considered as the principal cause of preternatural fatness; and this may be produced either by intemperance respecting the quantity of food eaten, by a more than usual disposition in the organs of digestion to convert the food into nutriment, or by circumstances which render the waste of nutriment unequal to the supply. Where the first is the case, temperance alone, as regulating the quantity eaten, is plainly indicated,



cated, and perhaps will be alone sufficient; but where a requisite degree of abstinence will not be submitted to, or where the same disposition to become fat subsists, though the quantity of food admitted be but moderate, the superabundant nutriment must be carried off by some outlet.

THE many facts which have been mentioned in the course of the preceding pages, in which the waste of nutriment seems to be produced by exposure to cold, and in which the retention of heat, in like manner, appears to produce a retention of nutriment, I think are fully sufficient to make us suppose that the surface of the skin, by affording an escape to the matter of heat, may become no inconsiderable agent in the prevention of fat; and that, therefore, frequent exposure to cold air, thin cloathing, and the cold bath habitually made use of, would contribute more to the removal of this complaint than has hitherto been imagined.

EXERCISE also, as more particularly tending to set at liberty the heat in the different parts of the body, and to allow of its more ready determination to the surface, must, if the surface be sufficiently exposed, greatly assist the escape of the matter of heat.

EXAMPLES of these circumstances, as tending to prevent an accumulation of fat, have already been cited in the instances of husbandmen, whose daily employments are laborious, who usually work in the open air, and who are for the most part thinly clad: and I think the same may be still more strongly exemplified in the case of animals.

IT has been before remarked, how happily (as respecting the retention or removal of heat from the body) nature has adapted the cloathing of different animals to their respective situations; those which live in warm climates having smooth skins with short hair, and which, therefore, sufficiently favor the escape of heat from them, whilst those  
which

which live in cold countries have long, rough, and shaggy coats, or are cloathed with wool or furs, which obviously tend to prevent that loss of heat which would otherwise in their situations be excessive.

IN some animals much fat, as adding to their weight and bulk, would be particularly inconvenient, and interfere with the obvious purposes for which their species were intended; and in these nature seems to have guarded against such a superabundance principally by this very circumstance; their thin cloathing allowing the ready escape of heat from them. The greyhound may be instanced as a striking proof of this remark; being intended for swift running; much fat would certainly be inconvenient to it; and the great exercise these dogs use, constantly setting at liberty the heat within their bodies, and their thin coverings admitting its ready escape from the surface, seem to prevent its being accumulated and deposited in the cellular substance:

IF, then, with these different coverings which different animals have, they should be made to change their situations; if those with coats which are calculated to restrain the escape of heat were to be removed to a warmer climate, and those with coverings which admit of its free escape should go to a colder country, it should be expected, according to the foregoing conjecture, that the former would become fat, and that the latter would shrink: and I believe a little observation will prove this to be really the case. England, though a temperate climate, is, when compared with others, both a warm and a cold one; to the inhabitants of the north of Europe, it is obviously a warm country, and to those who have always lived in the southern parts of it, it is equally a cold one. The rough-coated dogs of the north, namely, the Newfoundland, Siberian, Pomeranian, and the other smaller dogs called shock dogs, are remarkable for soon becoming fat here, and more especially the latter, as from their smaller size they are

more

more domesticated: on the other hand, the Italian greyhound, and the Turkish dogs, which have coats remarkably short, appear to be constantly cold, even in our rooms, and in the summer time, and I need not add that they are singularly thin and bare.

THESE observations are, however, evidently confined to mere individuals of animals; as if a species be long continued and propagated in a climate colder or warmer than that in which they were aboriginal, they experience in time that change of cloathing which their change of situation makes so requisite.

IN Buffon's admirable natural history of this animal, this circumstance is repeatedly noticed. The Irish greyhound, which he considers as the origin of all the varieties of the same species, when in its wild state in the northern and mountainous parts of that island, had a very long, shaggy and rough coat; the same animal transported to the  
southern



southern parts of Britain, naturalized to a warmer climate, and more domesticated, produced the English greyhound with a short coat; and in the warmer country of Italy, the still more delicately cloathed animal of the same name. Even the eastern dogs, which are totally without covering, and the long coated Iceland dogs, are supposed by the same author to constitute one and the same species; the present great difference between them having been produced by the latter having cast their hair when removed to the warm regions of Guinea and India; as dogs of all kinds do when in very warm climates\*.

IF, then, these facts respecting animals be considered as bearing any analogy to the human species, and we may be permitted to apply them on the present occasion, as they very much favor the foregoing general conjecture that a retention of the matter of heat is a

\* BUFFON'S Natural History, English Translation.  
Vol. IV. page 22.

principal cause of animal fat, there can be no doubt of the propriety of allowing the free escape of heat from the surface on the principle of preventing and reducing redundances of that substance, and more especially as this would seem to be putting in practice what nature herself does on similar occasions.

As exercise, and a free exposure of the body to cool air, can in very few circumstances be either impracticable or improper, and as their tendency has ever been found conducive to general health, they certainly, if capable of producing the effects we have supposed, must be much preferable to evacuations by purging and sweating. It must, however, be observed at the same time, that their effects, if equally certain, must, obviously, be more gradual and slow than the other evacuations, and that they must, therefore, not only be persevered in much longer, but even with those who are very prone to  
become

become fat, that they should become habitual.

THERE are some employments among men, which, (as in the case of the animals before remarked) render an increase of the bulk and weight of the persons engaged in them particularly inconvenient; that of riding jockies is most evidently so; and yet, if the preceding theory of the generation of fat should prove true, the means which are commonly used by these people to prevent their becoming fat must be badly calculated to promote the purpose intended, and at the same time cannot but be injurious to their health.

IT is usual with the jockies at Newmarket, for some time previous to riding, if they are over-weighted, to wear an extraordinary quantity of cloaths, and some of them who find themselves growing fat, constantly wear six or eight flannel waistcoats, obviously with  
the

the intention of inducing a continued state of perspiration; and if this be not produced by this additional apparel, they expose themselves at the same time to violent exercise to bring it on, and make use of all other means in their power to excite it.

THERE can be no doubt but if a considerable perspiration be produced, and for a long while kept up by these means, it must occasion a waste of the animal substance, and the persons must shrink; but this must, evidently, be an unhealthy practice, as a state of extraordinary sweating is, undoubtedly, a state of disease, and must considerably impair the natural strength; and the pale and sickly countenances of the persons who are the subjects of these experiments, sufficiently indicate the injured state of the system.

As without a great degree of perspiration, it is, therefore, very probable that the above practice of warm cloathing tends rather to promote an increase of fat than to prevent

it, and as with it, though the intention of reducing the fat should be obtained, the practice must be injurious to health, I think the opposite method of a free exposure to cold, would be well worth trying. The situations of these persons render them, indeed, very proper subjects for such an experiment; and as, if it answered the purpose, the practice would be so much more healthy than that at present made use of, I cannot help strongly recommending it to them: and, with this view, I would advise the constant use of the thinnest apparel, the being very much in the open air, even in the coldest seasons, the occasional use of the bath, and, except in very severe weather, to remain in the water rather longer than is usual. I need scarce add, that habitual temperance and constant exercise must still be requisite.

I know of no objection that can be offered to such a practice as this, except that the exposure to cold to the extent which would



would probably be requisite for the above purpose, may appear uncomfortable in some seasons of the year; but even this would be very little so in reality, as setting aside the sudden exposures of parts before kept very warm, the internal heat probably arrives at the surface so proportionately to its external escape, that those who habituate themselves to much cold feel as little of it as those who carefully guard against it; the face has already been instanced, in confirmation of this remark, as not experiencing, though always uncovered, a greater sense of cold than the other parts of the body.

AFTER all, I am ready to acknowledge that it would be, perhaps, a very difficult matter to prove, by actual experiment, that the free escape of heat does really prevent the accumulation of the adipose substance, or that it is capable of reducing superabundances already formed: as to do it with sufficient accuracy would require a long perseverance in trials not less irksome than those

related by Sanctorius; and I should imagine that there are few persons, who, like Sanctorius, could so patiently submit to them. But, as from the general consideration of the foregoing facts, the practice which I have recommended in cases of obesity appears at least to be, in some degree, likely to produce the effects I have supposed, and, (to repeat a remark already made more than once) as the general tendency of it, independent of the immediate object for which I have recommended it, must be salutary, I think I may, with propriety, advise an attention to it by medical practitioners.

## SECTION

## SECTION XXIII.

## CONCLUSION.

**T**HAT the matter of heat, when more than ordinarily accumulated on the surface, has a great share in producing many cutaneous diseases, is, I trust, rendered very probable by the foregoing observations, and is, perhaps, absolutely proved in the instances which have been related of the good effects of those topical applications which tend, in such cases, to carry it off more quickly than can be effected under the ordinary circumstances of the skin.

THERE

THERE can, I think, be no doubt, likewise, of its agency in producing some other diseases, and, as its operation appears, therefore, to be so powerful and so extensive, it surely deserves much greater attention from those who practice the art of medicine than seems hitherto to have been paid to it.

It may, however, appear somewhat extraordinary that cutaneous eruptions, exhibiting such various appearances as those which have been described, should all be produced by the same general cause; as were the simple accumulation of heat the sole cause of them, one would expect the effect of it, in all of them, to be nearly alike.

I CAN easily conceive that a very different apparent effect may be produced from heat, by a difference in the immediate application of it, by its being gradually excited on a part, or being more suddenly raised, as also by the greater or less degree of its application:  
more

more especially as such differences may be observed even in injuries from external fire; the effect of a burning substance applied to the body in a solid or in a liquid form is so different in its appearance, as to have the respective injuries occasioned by them distinguished by different names, as scalds and burns; the first most usually producing vesications on the part, and the latter commonly occasioning eschars.

I HAVE yet no doubt but the difference observed in those eruptions arises in some measure from causes which exist prior to, and are independent of the accumulation of heat, the latter itself being even an effect of the various primary causes of the disease. In some, probably, the heat is immediately excited on the part by the deposit of some acrid virus in the skin itself; in others, perhaps, an extraordinary degree of heat is generated within by the admission of some specific morbid principle into the system, and the heat accumulates on the surface merely by such



such a quantity arriving there in its common tendency to pass off by the skin, as cannot be carried off sufficiently fast under the usual circumstances of the patient; and in some it has already been observed to be owing to an artificial retention and accumulation of it, from the mismanagement of some diseases, as in the use of the hot regimen in fevers, and the improper methods of endeavoring to excite extraordinary sweating. But though these different circumstances may account for the different appearances of these eruptions, yet the principal injury sustained by the skin is still the immediate effect of heat, and the most obvious source of relief must be derived from a diminution of this material.

AT the same time, though I am strongly persuaded of the importance of an attention to this circumstance in the treatment of the before mentioned diseases, yet experience alone must establish the general propriety of the mode which I have recommended, and  
future

future observations, founded upon repeated experiments, must suggest peculiar variations in the different affections to which the general doctrine appears to be applicable.

THE preceding remarks being solely confined to the topical treatment of cutaneous diseases, I wish it to be further understood that they are not intended to interfere with any other method which may be indicated by concomitant symptoms, and more especially that the local applications which I have recommended should not supersede the use of internal and alterative medicines in those cases in which the primary cause is, obviously, a morbid disposition of the habit.

IT may not, in this place, be improper, as being nearly connected with the treatment of several of the preceding cutaneous affections, more particularly to consider a circumstance which has one or twice before been slightly adverted to; I mean the exposure of wounds to the external air.

THE destruction of the teguments and contiguous parts by ulceration and digestion may certainly be considered as a kind of decomposition of such parts, during which something is set at liberty which is absorbed by the atmospheric air: There can be little doubt, according to the present principles of chemistry, but this is phlogiston, and that the affinity which the surrounding air has to this material disposes it to take up the phlogiston in this instance, in the same manner as it receives it from the blood in the lungs during respiration, and from other animal and vegetable substances during putrefaction.

THE free access of the external air, must, therefore, obviously tend, on common chemical principles, to promote this decomposition; and that it is so in fact is evident from several positive and many negative proofs.

THE bad effects of admitting air into cavities has long been observed by surgeons; thus

thus the making openings into joints, and large incisions into tumors of the ganglion kind, the hydrocele, &c. is well known often to bring on very formidable symptoms; and in scrophulous abscesses the free access of air sometimes produces the most dreadful ravages, the part, from its peculiarly morbid state, being more than usually unable to resist the destructive quality of the air.

IN suppurations of the female breast after lying in, it was a long time the practice to make large openings into the part, and to dilate every sinus which could be discovered by the probe; but the cures under such treatment were frequently protracted to a most intolerable length of time; the breast, during the whole of it, suffering a great waste of substance; and it has since been found by experience that, when suffered to break naturally, or when opened by mere puncture, so that the air is kept out, the cure is accomplished much sooner, more easily, and with much less injury to the part.

WHEN a wound of a tolerably regular figure is made with a sharp instrument, and the sides of it are brought at once into immediate contact, so that the external air has no access to it, it will heal very expeditiously, and without the usual and painful progressive circumstances of inflammation, digestion, &c. and wounds cured in this way are said to be healed by the first intention. Every surgeon must have had repeated experience of large wounds healing on this principle; and the operation for the hare-lip, and the late much improved method of dressing stumps after amputation, as suggested by Mr. Alanson, are the most decisive proofs of it. I may also add, as a similar fact, (several instances of which have lately come to my knowledge) that the wound made in the operation for the bubonocoele, if kept properly covered, will, in the same manner, heal by the first intention.

IN wounds of the scalp and forehead, the difference observed between those which are  
exposed,



exposed, and those from which the air is excluded, is particularly worth noticing in this place. If a piece of lint, or common adhesive plaster be immediately applied to such wounds, even of a considerable extent, and be not removed for several days, they will unite in a short time without discharge, and with a small proportionate cicatrix; but if exposed much at first, and frequently opened afterwards, a very considerable suppuration usually comes on, a great loss of substance takes place, they are very slow in healing, and a large scar is the consequence\*.

THIS circumstance has likewise been found so true in the instance of wounds in  
compound

\* THE female breast, those glands which are the usual seats of serophulous affections, and the scalp, particularly that part of it which covers the os frontis, seem to be more affected by the contact of the air than the other parts of the body. Is it not probable that the two former being of a looser texture, and less compact than muscular substance, they more slightly retain that principle for which the air has so strong an affinity, and that, therefore, they more easily undergo decomposition?

These

compound fractures, that, I believe, it is at present an universal practice with surgeons to open them very seldom after the first dressing.

EVEN wounds, in which there has been such a loss of substance sustained, and the

These parts being also more hollow and cavernous than other parts, the air is enabled to penetrate further into them, it touches at more points, and is longer retained by them.

IN wounds of the scalp, likewise, though the part is muscular, yet I am of opinion that a cause similar to the foregoing produces this effect. This part being composed of muscles which are thin and delicate, and being intended to move quickly, frequently, and in various directions, on the bony cranium underneath, a considerable quantity of the *membrana adiposa* is interposed between them and the cranium; the texture of which, being loose and cellular, admits the air more readily, and is more easily affected by it; and, agreeably to this conjecture, it may be observed, that in these cases, the mischief occasioned by the access of the air extends, often, a considerable way under the scalp, and much beyond the limits of the original injury. All which should certainly lead us to be particularly attentive to the exclusion of the air in wounds of those parts.

figure

figure is so irregular that the edges cannot be brought into contact, if left to nature, will often heal on the same principle: The blood, which on such occasions covers the wound, if not wiped away, soon coagulates and dries upon its surface, and such a crust is formed thereby as totally excludes the external air; and it is, I am persuaded, for this reason that very large wounds on animals so frequently heal without any application from art.

COURT plaster, and gold beater's skin, have the reputation of healing fresh wounds; and it may very easily be conceived that they should do it, on the same principle of keeping out the air.

THE disadvantage of dressing wounds too frequently has been remarked by surgeons many years ago, but this was supposed to arise as much from the mere wiping away the pus on the surface, which was said to be a natural balsam, and to possess a healing quality,

quality, as from there being something noxious in the air \*.

I REMEMBER, a few years ago, that much advantage was expected from the use of long continued pressure on wounds, some instances having, at that time, occurred, of foul ulcers, which had resisted the common applications, having healed by such treatment: But even in these I have no doubt but the exclusion of the external air alone effected the cures; and I cannot help conjecturing, therefore, that had this been generally so understood at that time, the practice would have continued; but from an idea that the pressure alone was beneficial, it was carried to an improper degree, such thick compresses, made more heavy by the addition of lead, and tightly bound down by rollers, being made use of, as were very soon found injurious, and put a stop to a

\* Belloste's Hospital Surgeon. Chapters X. and XI.

practice which, more moderately applied, would, probably, have continued useful.

THE impressions left on the face by the variolous pustules, and which are evidently deeper than on any other part of the skin, are, probably, owing to the same circumstance. The face being more exposed than the rest of the body, the air has certainly freer access to it; and it may, therefore, be easily supposed that the decomposition of the part, first begun by the heat accumulated on it, will there be more extensive than elsewhere\*.

FROM the various instances enumerated, there can remain no doubt but the external  
air,

\* AN attention to this circumstance might, possibly, prevent or lessen the scars, which, in this disease, sometimes, so greatly deform the face, especially if means could be used to prevent the contact of the air without increasing the heat of the part. Gold beater's skin, or some such thin membranous substance, seems to be the most calculated for this purpose; were the face perfectly covered with this, the air would certainly be sufficiently

T t

excluded



air, if freely and frequently admitted to wounds, will very much retard their healing, and in cases in which there is a morbid disposition of the parts, and a tendency to a decomposition has taken place, that it will promote their further destruction.

IT becomes, therefore, of the utmost consequence to attend to this circumstance in the application of the preceding doctrine; for I am well aware that cases may happen in which, from an inattention to this circumstance, such an injury may be produced by the air coming into too frequent contact

excluded from it, and if kept constantly moist by milk and water, or any mild lotion, the inconvenience from its becoming stiff, and the injury from its heating the part, would be prevented. Greasy liniments, and even plasters thinly spread, would seem, also, to answer this purpose; but I should object to all applications of this kind, from a persuasion that they have a tendency to increase the heat of the part.

I OFFER the whole, however, merely as a practical hint, and if it be admitted that the general principle is right, perhaps other persons may suggest more convenient and more proper methods of applying it.

with

with the part, as more than to counterbalance the advantage derived from that escape of heat which may still be effected by exposure; and that, therefore, from not duly considering this principle, the failure of the case may be unjustly attributed to the cold produced by this new mode of treatment; and more especially as the apprehension of danger from cold is a very popular fear.

THE cases in which this may happen, it is obvious, however, can only be those in which the skin has been previously divided, and some digestion or exulceration already taken place; and the reader may recollect, that in these very cases I have, for this reason, recommended the use of wet linen rags to be constantly kept on the part.

THERE is yet another circumstance which it may be necessary to mention before I entirely quit the subject; and this is the difference between phlogiston and the matter of heat.

To those who are conversant with the late discoveries respecting these principles, and the various experiments which have been made by philosophers since they have been the subjects of general investigation, this distinction is sufficiently obvious; but the similarity between the words fire and phlogiston, or principle of inflammability, and the relation which they bear to one another, has led many persons, unacquainted with chemistry, to confound them.

It would, indeed, be very difficult to give a precise and truly philosophical definition of phlogiston, but this is scarce necessary in the present instance, it being only required to shew that these are different substances, and which may be done by mentioning some of the facts which prove their separation from bodies at different times and under different circumstances, and of others which prove the different effects of the combination of each with other substances.

IN all the bodies in which phlogiston is found, it exists as a necessary ingredient or component part, and is not separated but by the body undergoing some chemical change. The matter of heat exists, likewise, in bodies in the same manner, but besides this, it is constantly found loosely united with bodies, and has a tendency to change its situation by the contact of others containing less of it, that which contains the most giving over to that which has the least until an equal quantity be distributed through each; and this is effected without either of the bodies undergoing any chemical change.

It may be observed, however, that the matter of heat, as a component part, certainly exists in all bodies containing phlogiston, and the former usually escapes when the latter is set at liberty, as appears from the operations of combustion and putrefaction.

RESPECTING the living animal body, it has been shewn that phlogiston is separated from

from the blood in the lungs, during respiration, and enters into a combination with the atmospheric air received into them by that operation; and this is evidently effected on the principle of chemical attraction, the phlogiston having a greater affinity for the air than it had for the blood, and, accordingly, quitting the latter, and uniting with the former. On the contrary, the matter of heat, I mean that which is sensible, having the before mentioned tendency to pass over from that body which has a larger portion of it, to others which have a smaller, is constantly escaping from the surface of the body, and the other outlets to all surrounding bodies, which are of a lower temperature, and without the body, which parts with the heat, or those which receive it, undergoing any chemical change.

THE matter of heat subsists, likewise, in bodies which have none of the principle of inflammability: in pure water, which, I believe, has not yet been proved to contain any,



any\*, it certainly constitutes one of its component parts; without it, its fluid form would be lost; and it is known that vapor requires a larger quantity of it as an ingredient than water: the various changes which this body undergoes from vapor to water, water to ice, and vice versa, being so many chemical processes in which the matter of heat is received or parted with.

\* THE theory which has lately been given to the world by Mr. Cavendish\*, is, I acknowledge, directly opposite to this assertion. It is, however, with great reluctance that we should receive new theories, even though proposed by philosophers so justly eminent as the author of the preceding hypothesis, when they are supported only by one species of philosophical evidence. The supposition that water is compounded of pure air and phlogiston, rests solely upon a single experiment, or rather upon a synthetic process, which is not confirmed by any fact bearing even the least resemblance of a true analysis. When either inflammable or pure air can be procured from water, in such a way as not to admit the possibility of a supposition that they proceed from some third body, then, and, I conceive, not before, the theory may be considered as established.

---

\* Philosophical Transactions, vol. LXXIV. for year 1784.

THE union of phlogiston with the calces of metals is well known to restore all their metallic properties; whereas the addition of heat without phlogiston, I believe, will produce no chemical change upon them\*.

ANOTHER, and perhaps the most striking distinction between these substances may be shewn in the effects produced by their respective combinations with atmospheric air; the union of one of them only with it

\* THE experiments of Scheele\* would, indeed, seem to prove that the calces of metals may be revived by the application of heat alone; and this certainly agrees perfectly with his theory, which supposes the matter of heat to be a compound of empyreal air and phlogiston. There are, however, so many circumstances remaining to be proved, and so many possibilities of mistake in the experiments alluded to; they are so different, likewise, in the language they speak, from many well known and established facts, that much labor must be used, and much new experience be acquired, before we can regard this hypothesis even as probable.

---

\* Chemical Observations and Experiments on Air and Fire.  
English Translation.

rendering it unfit for the support of animal life. Air is certainly not rendered unfit for this purpose merely by being heated; for, provided it be not heated to a degree which will prevent the necessary escape of heat generated in the animal, (and the late experiments of Dr. Blagden, in heated rooms, prove that a very high temperature will not prevent this,) it will be still capable of receiving phlogiston, and, consequently, be equally fit for respiration; whereas air which is saturated with phlogiston, though its temperature, with respect to heat, be ever so low, being unable to receive any more of this principle, must, consequently, be unfit for breathing.

HEATED air and phlogisticated air are, therefore, very different things, and, consequently, cold air (I use the word in a relative sense,) and dephlogisticated air must, also, be very different.

I HAVE been led into these remarks, because, when Dr. Priestley's celebrated dis-

U u

covery

covery of dephlogisticated air was first made known, the very difference, which I have endeavoured to explain, was really confounded, and, under the idea that dephlogisticated air was air deprived of the principle of heat, it was imagined that, when applied to any part overloaded with heat, it would very readily absorb the superabundant quantity; and I well remember to have heard of a case of inverted uterus, much talked of at that time, in which the reduction of the part, which was much swelled and inflamed, was said to have been effected in consequence of the liberal application of this air.

THAT air, though dephlogisticated, may be of a temperature so much below the heat of a diseased part as to become a ready conductor of the heat from it, is very easy to conceive, and it might, therefore, upon this principle, have really been useful in the instance recited: it is, however, at the same time obvious, that any other application equally cold, or that could have conducted heat

heat with equal celerity, would have answered the same purpose; and as, supposing the part to have been ulcerated, it is evident, on the principle lately recited, that even common air would have tended to increase the ulceration, dephlogisticated air, as having a greater proportionate power of absorbing phlogiston, would have been still more disposed to promote the destruction of the part, and, consequently, under such circumstances, have been a very pernicious application.

THESE distinctions, between the matter of heat and phlogiston, being premised, and the requisite caution respecting the access of air to parts in a state of ulceration being observed, I should hope that the practical application of the foregoing general principles respecting the escape of heat can in no instance be attended with hazard, and, when from further experience, and the observations of different practitioners, the subject shall be more fully investigated and understood, that it will prove a real improvement



ment in the medical treatment not only of those diseases which have, in the foregoing pages, being particularly recited, but in all others which may arise from similar affections.

## THE END.

---

### E R R A T A.

Page 12, line 21, dele *that*.

16, 21, dele *that*.

18, 11, for *agreeable*, read *agreeably*.

44, 10, for *superabundancies*, read *superabundances*.

11, for *who*, read *which*.

163, 6 and 7, for the *production* of an unusual degree of heat,  
read *an unusual degree of heat produced*.

---

*Lately published by the AUTHOR of the  
preceding ESSAY.*

An ESSAY on the UTERINE HÆMORRHAGE,  
which precedes the Delivery of the FULL GROWN  
FŒTUS. Illustrated with Cases.--The Third Edi-  
tion.

Also, an ESSAY on the Use of the RED PERUVIAN  
BARK in the Cure of Intermittents.















